**OMNIZONE™**
**50BV020-064**
**Water-Cooled and Remote Air-Cooled Indoor Self-Contained Systems and Water-Cooled Heat Pumps**

# Installation, Start-Up and Service Instructions

## CONTENTS



## SAFETY CONSIDERATIONS

Installing, starting up, and servicing air-conditioning components and equipment can be dangerous. Only trained, qualified installers and service mechanics should install, start-up, and service this equipment.

When working on the equipment, observe precautions in the literature and on tags, stickers, and labels attached to the

equipment. Follow all safety codes. Wear safety glasses and work gloves.

**⚠ WARNING**

Before performing service or maintenance operations on unit, turn off main power switch to unit and open all disconnects. More than one disconnect switch may be required to deenergize this equipment. Electric shock hazard can cause injury or death.

**⚠ CAUTION**

Use care in handling, rigging, and setting bulky equipment.

## GENERAL

Omnizone™ 50BV indoor packaged units are very flexible for a variety of applications. These self-contained units are available as water-cooled or remote air-cooled air conditioning units. The 50BV units are available with either constant volume (CV) or variable air volume (VAV) controls. In addition, the 50BV unit is available as a water-cooled heat pump. Finally, Omnizone 50BV units are available in two cabinet styles. Nominal 18 through 30-ton units are constructed in a single-piece, unpainted galvanized cabinet. Nominal 30 through 60-ton units are available as modular units, and can be taken apart for easier installation. Modular units are built using an unpainted, galvanized steel cabinet with steel framework, and can be easily disassembled without breaking the refrigerant lines. See Table 1 for a model number reference by application.

Each unit contains multiple scroll compressors piped in separate refrigerant circuits. Each water-cooled circuit includes a coaxial (tube-in-tube) condenser, TXV (thermostatic expansion valve), individual evaporator coils, and all interconnecting piping. Water-cooled units are shipped fully charged with refrigerant. Remote air-cooled units are shipped with a nitrogen holding charge.

Each unit is equipped with one or two forward-curved centrifugal blowers, to ensure quiet air delivery to the conditioned space. Constant volume units operate at a single, adjustable fan speed and provide zone temperature control using a standard commercial thermostat. For VAV applications, the unit is supplied with a variable frequency drive(s) (VFD) that automatically adjusts blower speed to maintain a constant, adjustable duct static pressure. Compressors are automatically staged to provide supply air temperature control (VAV applications) or zone temperature control using a two-stage commercial thermostat (CV applications).

The 50BV units have removable access panels for easy servicing. These panels allow access to controls, compressors, condensers, VFD(s) (if applicable), evaporator motors, blowers, belts, pulleys, and refrigeration components.

## MAJOR SYSTEM COMPONENTS

### Constant Volume (CV) Units

MAIN CONTROL BOARD (MCB) — The main control board for the 50BVC, E, Q, T, U, and V units provides both controls and diagnostics including:

- Condensate Overflow Protection prevents unit operation in the event that the drain pan clogs (optional sensors required).
- Random Start provides a programmable start with a range of 30 to 60 seconds.
- Anti-short Cycle Timer provides a 5-minute delay to prevent compressor short cycling.
- Low Pressure Bypass Timer bypasses the low-pressure switch for 90 seconds to avoid nuisance trips during cold start-up.
- High Pressure Switch Delay is a one-second delay that prevents nuisance trips at start-up.
- Brownout/Surge/Power Interruption Protection is a 20-second moving scale that works in conjunction with the random start timer to delay unit start when a nuisance lockout would otherwise have occurred. This allows the water pumps to restart and establish water flow.
- Alarm Output contacts provide remote fault indication.
- Test/Service Pin is a jumper that reduces all time delay settings to 6 seconds during troubleshooting or operation verification.
- Reset occurs after a 5-minute delay when a fault condition occurs. When the timer expires, the unit will restart. If the same condition occurs a second time, the unit will be locked out.
- Lockout Reset requires that the unit power be cycled at the unit controller via either the thermostat or unit disconnect.

NOTE: The refrigerant circuits on dual compressor models are completely independent. If either stage has a fault condition the remaining stage will continue to operate without interruption. A freeze (optional sensor required) or condensate overflow lockout will shut down both refrigerant circuits.

- LEDs are provided for diagnostic purposes.

**Variable Air Volume (VAV) Units —** The 50BVJ, K, W, and X units come equipped with a Carrier 6400 Comfort Controller and a VFD. Refer to the 50BV,XJ Controls, Operation and Troubleshooting manual for details.

NOTE: The VAV units utilize face split coils and should not be operated below 50% of nominal airflow to prevent coil freezing.

**Table 1 — Model Number Reference By Application Type**

| MODEL | TYPE* | AVAILABLE CAPACITY | CONSTRUCTION | CONTROLS |
|---|---|---|---|---|
| **50BVC** | Water-Cooled | 18 to 30 nominal tons | Single-piece | CV |
| **50BVE** | Remote Air-Cooled | 18 to 30 nominal tons | Single-piece | CV |
| **50BVQ** | Water-Cooled Heat Pump | 18 to 30 nominal tons | Single-piece | CV |
| **50BVJ** | Water-Cooled | 18 to 30 nominal tons | Single-piece | VAV |
| **50BVK** | Remote Air-Cooled | 18 to 30 nominal tons | Single-piece | VAV |
| **50BVT** | Water-Cooled | 30 to 60 nominal tons | Modular | CV |
| **50BVU** | Remote Air-Cooled | 30 to 60 nominal tons | Modular | CV |
| **50BVV** | Water-Cooled Heat Pump | 30 to 60 nominal tons | Modular | CV |
| **50BVW** | Water-Cooled | 30 to 60 nominal tons | Modular | VAV |
| **50BVX** | Remote Air-Cooled | 30 to 60 nominal tons | Modular | VAV |

LEGEND

**CV** — Constant Volume
**VAV** — Variable Air Volume

*All units are cooling only unless specified.

## INSTALLATION

Omnizone™ 50BV units are intended for indoor installation only. Determine building alterations required to run piping, wiring, and ductwork. Read all installation instructions before installing the unit.

### Step 1 — Complete Pre-Installation Checks

EXAMINE THE UNIT — Examine the unit for shipping damage. File a claim with the transit company if damage is found. Check the shipment for completeness. Verify that the nameplate electrical requirements match the available power supply.

UNIT STORAGE — The 50BV units are designed and packaged for indoor storage and use only. If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area. Units must only be stored or moved in the normal upright position, as indicated by the "UP" arrows on each carton, at all times. DO NOT STACK UNITS.

MODULAR UNITS — The 50BVT,U,V,W,X units are shipped in multiple sections for easy movement and installation. The separate modules will pass through a standard 36-in. steel-framed door or service elevator. Circuit integrity is maintained because none of the refrigerant piping requires disconnection. Water piping connections are made with the use of heavy-duty bronze-bodied unions so no field welding or brazing is required. See Table 2 for the number of sections per unit.

**Table 2 — Modular Unit Shipping Table**

| SECTIONS | NUMBER OF SECTIONS 50BVT, U, V, W, X | | | |
|---|---|---|---|---|
| | 034 | 044 | 054 | 064 |
| **Main Air Conditioning**<br>**Weight (lb) (each)** | 1<br>2100 | 2<br>1825 | 2<br>2200 | 2<br>2225 |
| **Reheat Coil Option**<br>**Weight (lb) (each)** | 1<br>40 | 2<br>40 | 2<br>40 | 2<br>40 |
| **Economizer/Filter**<br>**Filter Section Weight (lb)**<br>**Economizer Weight (lb)** | 1<br>310<br>200 | 2<br>310<br>200 | 2<br>310<br>200 | 2<br>310<br>200 |
| **Fan Section**<br>**Weight (lb) (each)** | 1<br>650 | 2<br>650 | 2<br>650 | 2<br>650 |
| **Total Unit**<br>**Weight (lb)** | 4<br>3300 | 8<br>5400 | 8<br>6150 | 8<br>6150 |

NOTE: Units ship with the main air conditioning, economizer/filter, and, when selected, the reheat coil sections assembled together. These can be easily disassembled, as required, in the field. The fan section(s) always ships separately.

**Step 2 — Rig and Place Unit —** Use proper lifting and handling practices to avoid damage to the unit. Move modular units with a fork truck using the baserails provided, or use spreader bars and lifting straps as shown in Fig. 1.

For single piece units, use spreader bars and rigging straps if lifting with a crane to avoid damage to the unit. Otherwise, move with a fork truck using the shipping pallet.

Refer to Fig. 2-14 for unit dimensions.

Refer to Tables 3A and 3B for physical data.

REMOVE PACKAGING — Remove all protective plastic, remove and discard unit top cover protector, filter cover, controller display protector, and water piping connection packaging.

UNIT LOCATION — Locate the unit in an indoor area that allows easy removal of the filters, access panels, and accessories. Make certain enough space is available for service personnel to perform maintenance or repairs. Provide sufficient room to make all water, duct, and electrical connections. If the unit is located in a small mechanical equipment room, make sure adequate space is available for air to return freely to the unit. These units are not approved for outdoor installations and must be installed inside the structure. Do not locate in areas that are subject to freezing.

UNIT PLACEMENT — Ensure that the floor is structurally strong enough to support the weight of the equipment with minimum deflection. A good, level floor is required for proper unit operation and to ensure proper fit-up and alignment of all bolt together and union coupled modules on modular units.

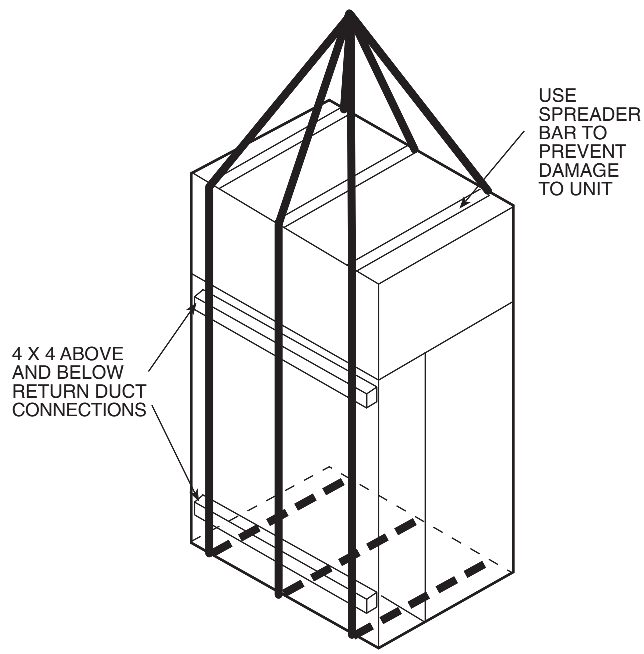
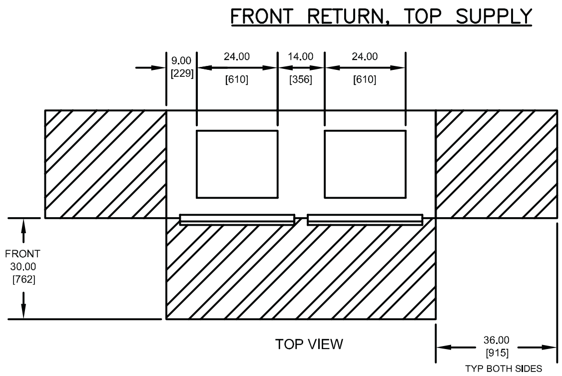



**Fig. 1 — Modular Unit Rigging**




| | 50BV(C)(Q)(J) UNIT NOMINAL SIZE | | | |
|---|---|---|---|---|
| | 020 | 024 | 028 | 034 |
| A | 14.75 [375] | 14.75 [375] | 14.75 [375] | 15.00 [381] |
| B | 8.50 [216] | 8.75 [222] | 8.75 [222] | 9.00 [229] |
| C | 2.75 [70] | 2.75 [70] | 2.75 [70] | 3.50 [89] |
| D | 40.00 [1016] | 40.00 [1016] | 40.00 [1016] | 60.00 [1524] |
| E | 20.00 [508] | 20.00 [508] | 20.00 [508] | 30.00 [762] |
| F | 38.00 [965] | 38.00 [965] | 38.00 [965] | 58.00 [1473] |
| G | 62.00 [1575] | 66.50 [1689] | 66.50 [1689] | 86.50 [2197] |
| H | 4.00 [101] | 4.00 [101] | 4.00 [101] | 4.00 [101] |
| J | 18.75 [476] | 18.75 [476] | 18.75 [476] | 18.75 [476] |
| WATER CONN. | 2" FPT | 2" FPT | 2" FPT | 2" FPT |
| CONDENSATE CONN. | 1-1/4" FPT | 1-1/4" FPT | 1-1/4" FPT | 1-1/4" FPT |
| FILTER QTY. & SIZE | (4) 20 x 34-1/2 x 1" | (4) 20 x 34-1/2 x 1" | (4) 20 x 34-1/2 x 1" | (4) 30 x 34-1/2 x 1" |

NOTES:
1. Dimensions in inches [mm].
2. VAV models (50BVJ) are rear return, top supply only.
3. Compressor, controls, and condenser access are through front panels.
4. Field power connections are 1-3/4 inches. Control connections are 7/8 inches.
5. Optional blower orientation is selected in model number nomenclature as option 9 in FIOP section (digits 15 and 16).

Shows recommended minimum service clearances.

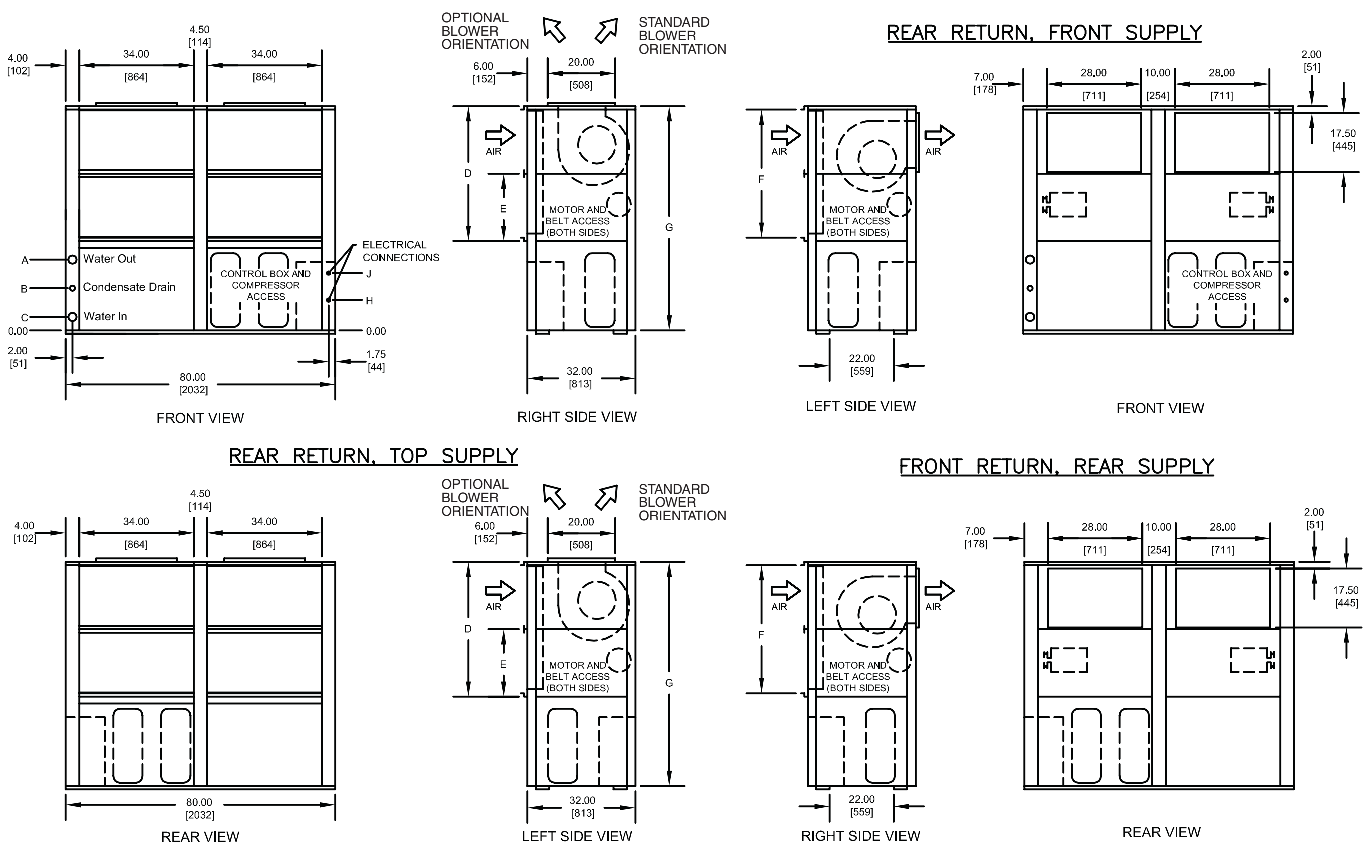


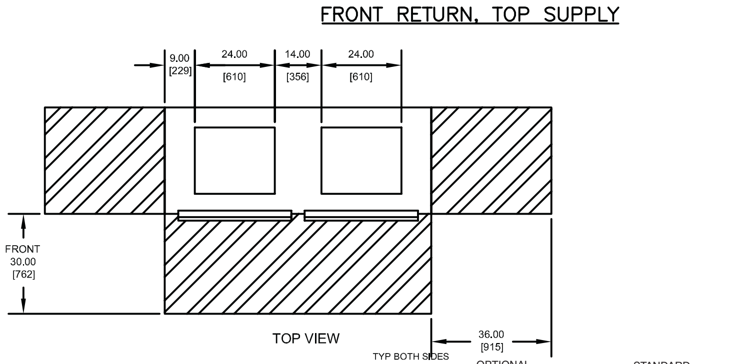

**Fig. 2 — 50BVC,J,Q020-034 Dimensions**

| | 50BV(E)(K) UNIT NOMINAL SIZE | | | |
|---|---|---|---|---|
| | 020 | 024 | 028 | 034 |
| D | 40.00 [1016] | 40.00 [1016] | 40.00 [1016] | 60.00 [1524] |
| E | 20.00 [508] | 20.00 [508] | 20.00 [508] | 30.00 [762] |
| F | 38.00 [965] | 38.00 [965] | 38.00 [965] | 58.00 [1473] |
| G | 62.00 [1575] | 66.50 [1689] | 66.50 [1689] | 86.50 [2197] |
| H | 4.00 [101] | 4.00 [101] | 4.00 [101] | 4.00 [101] |
| J | 18.75 [476] | 18.75 [476] | 18.75 [476] | 18.75 [476] |
| CONDENSATE CONN. | 1-1/4" FPT | 1-1/4" FPT | 1-1/4" FPT | 1-1/4" FPT |
| FILTER QTY. & SIZE | (4) 20 x 34-1/2 x 1" | (4) 20 x 34-1/2 x 1" | (4) 20 x 34-1/2 x 1" | (4) 30 x 34-1/2 x 1" |

NOTES:
1. Dimensions in inches [mm].
2. VAV models (50BVK) are rear return, top supply only.
3. Compressor, controls, and condenser access are through front panels.
4. Field power connections are 1-3/4 inches. Control connections are 7/8 inches.
5. Discharge (hot gas) connections are 1-1/8 in. OD.
6. Liquid line connections are 7/8 in. OD.
7. Optional blower orientation is selected in model number nomenclature as option 9 in FIOP section (digits 15 and 16).

RECOMMENDED CONDENSER MATCHES:
50BV020 ⟶ one (1) 09DK020 (50/50 split each)
50BV024 ⟶ one (1) 09DK024 (50/50 split each)
50BV028 ⟶ one (1) 09DK028 (50/50 split each)
50BV034 ⟶ one (1) 09DK034 (50/50 split each)

Shows recommended minimum service clearances.



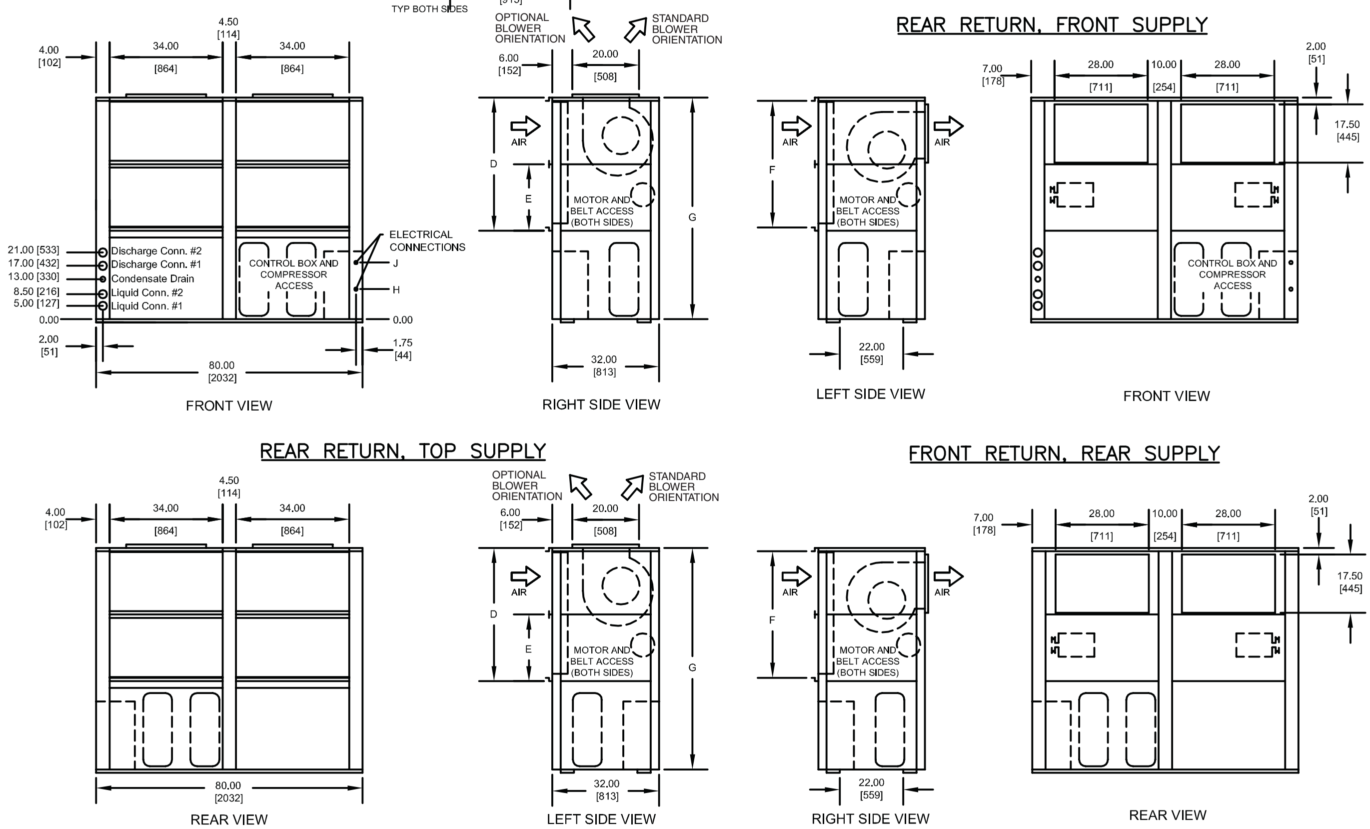
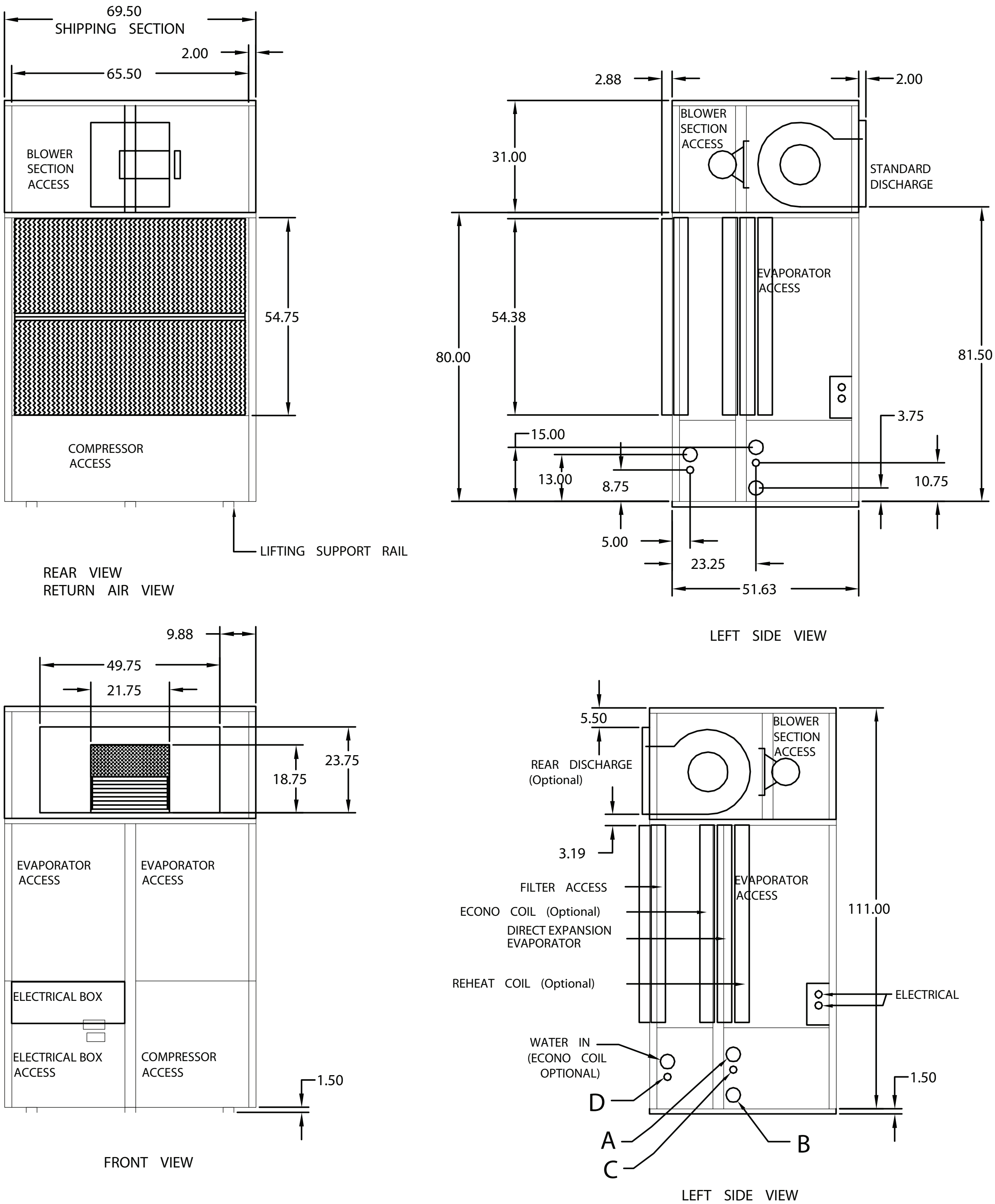




**Fig. 3 — 50BVE,K020-034 Dimensions**



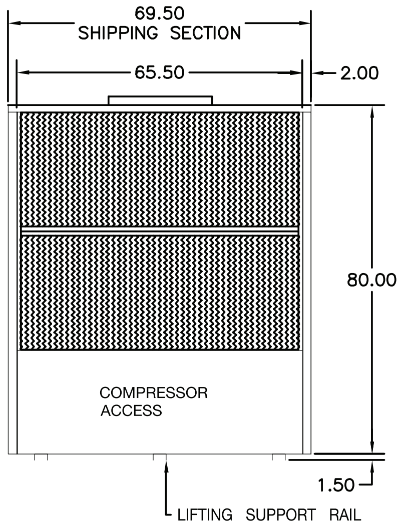

NOTES:
1. Dimensions in inches.
2. All units are rear return airflow configuration.
3. Constant volume units are available with front or rear air supply.
4. VAV units (50BVW) are available with rear supply only.
5. Recommended minimum service clearances are as follows:
   a. Front and rear — 30 in. (762 mm)
   b. Left or right side — 65 in. (1651 mm) for coil removal
   c. Side opposite coil removal — 20 in. (508 mm)

CONNECTIONS

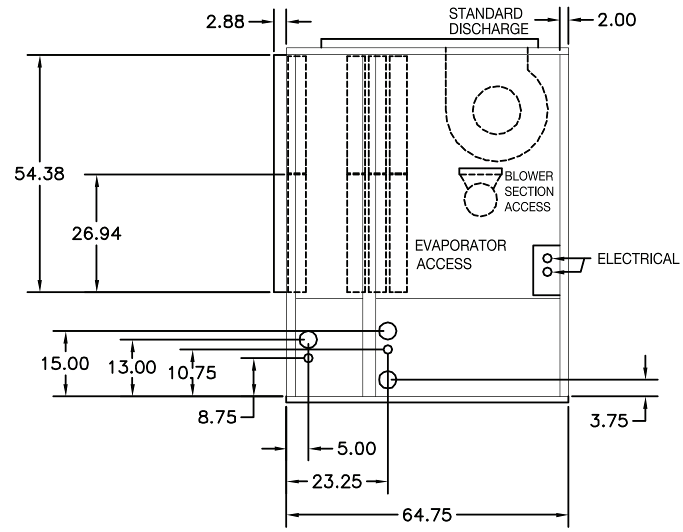
| | | |
|---|---|---|
| A | WATER OUT | 2-1/2 in. FPT |
| B | WATER IN | 2-1/2 in. FPT |
| C | CONDENSATE DRAIN | 1-1/4 in. FPT |
| D | ECONOMIZER DRAIN | 1-1/4 in. FPT |

REPLACEMENT FILTERS : EIGHT (8) AT 17 x 27 x 4 INCHES.

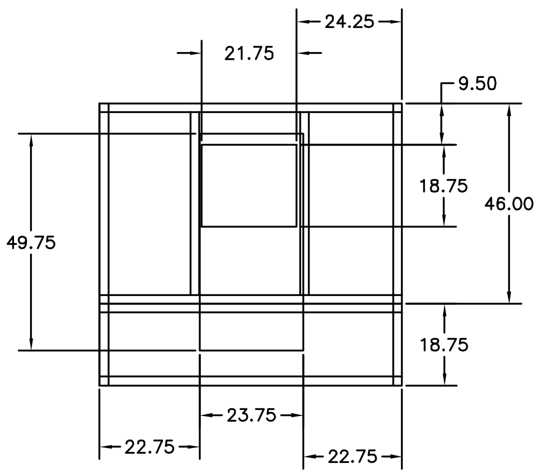
**Fig. 4 — 50BVT,V,W034 (High-Boy) Dimensions**



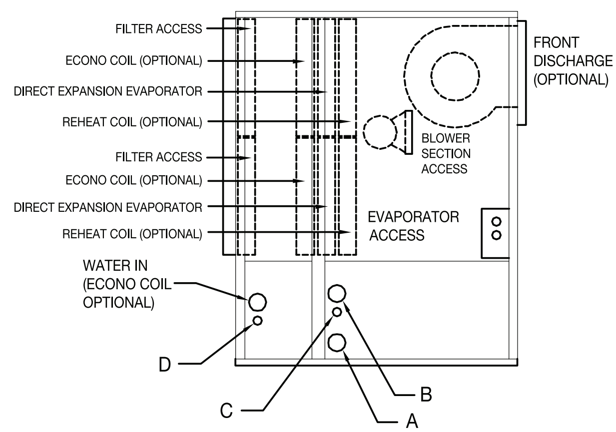

REAR VIEW
RETURN AIR VIEW




LEFT SIDE VIEW




TOP DISCHARGE
TOP VIEW

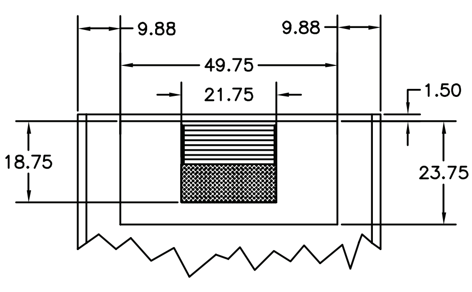



LEFT SIDE VIEW

CONNECTIONS

| | | |
|---|---|---|
| A | WATER OUT | 2-1/2 in. FPT |
| B | WATER IN | 2-1/2 in. FPT |
| C | CONDENSATE DRAIN | 1-1/4 in. FPT |
| D | ECONOMIZER DRAIN | 1-1/4 in. FPT |

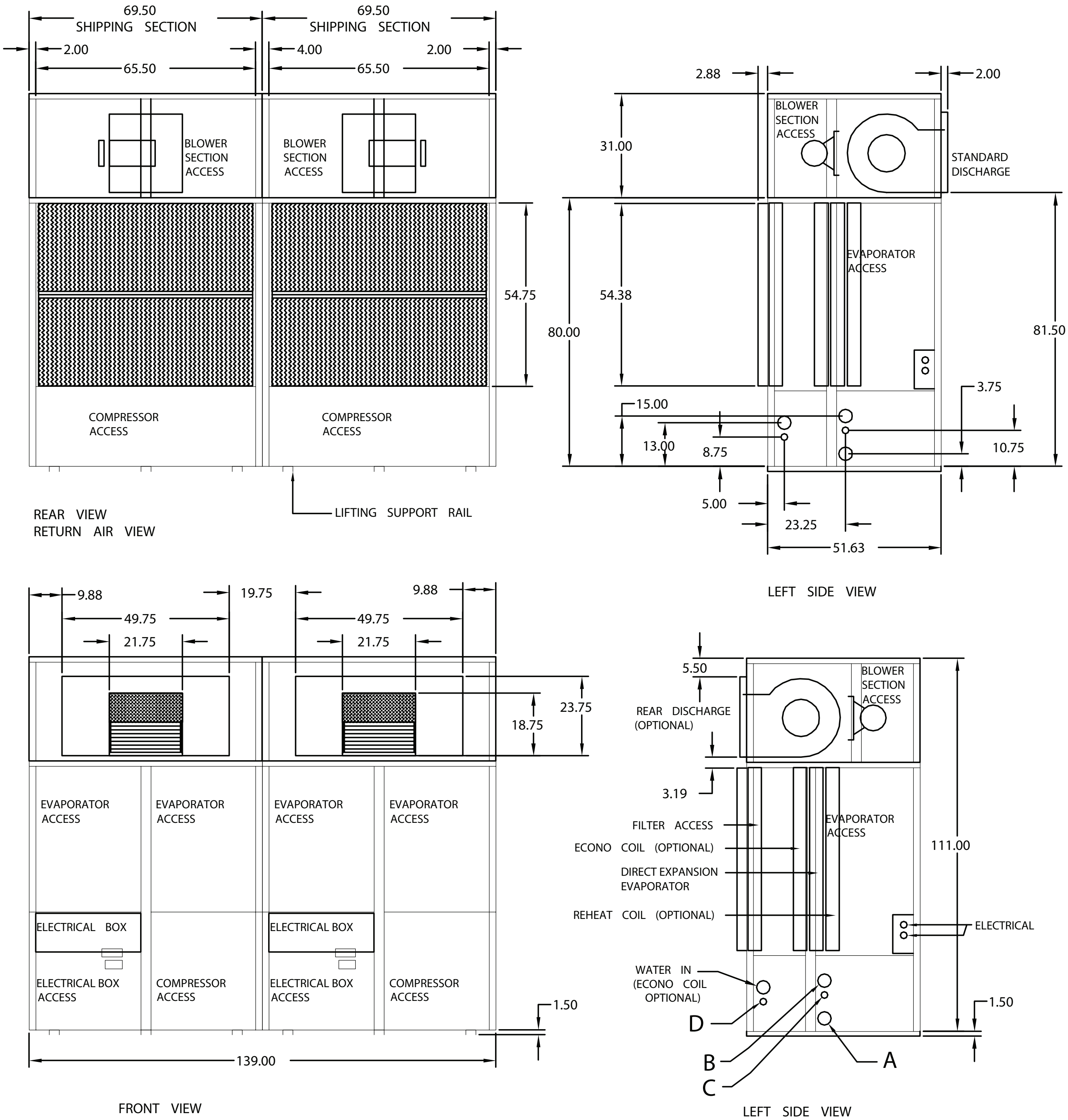
REPLACEMENT FILTERS : EIGHT (8) AT 17 x 27 x 4 INCHES.




PARTIAL VIEW OF
FRONT DISCHARGE

NOTES:
1. Dimensions in inches.
2. All units are rear return airflow configuration.
3. Recommended minimum service clearances are as follows:
   a. Front and rear — 30 in. (762 mm)
   b. Left or right side — 65 in. (1651 mm) for coil removal
   c. Side opposite coil removal — 20 in. (508 mm)

**Fig. 5 — 50BVT,V,W034 (Low-Boy) Dimensions**



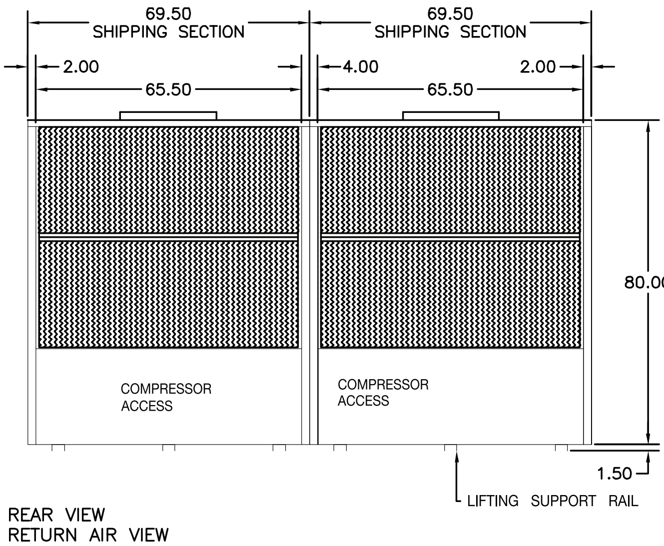

NOTES:
1. Dimensions in inches.
2. All units are rear return airflow configuration.
3. CV units are available with front or rear air supply.
4. VAV units (50BVW) are available with rear supply only.
5. Recommended minimum service clearances are as follows:
   a. Front and rear — 30 in. (762 mm)
   b. Left and right sides — 65 in. (1651 mm) for coil removal

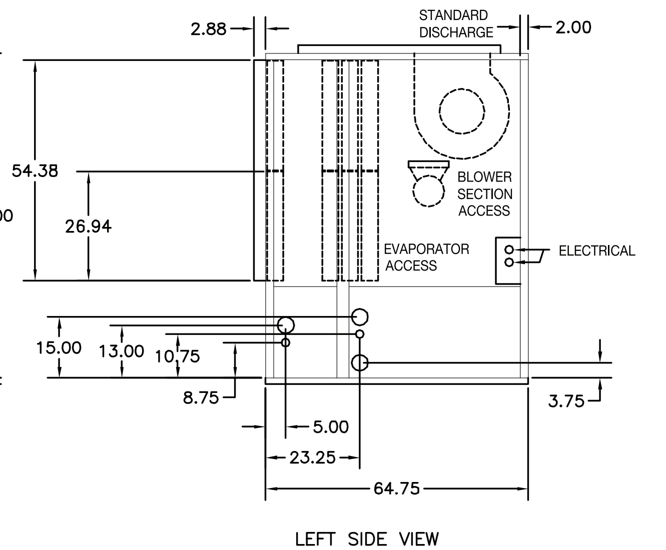
CONNECTIONS

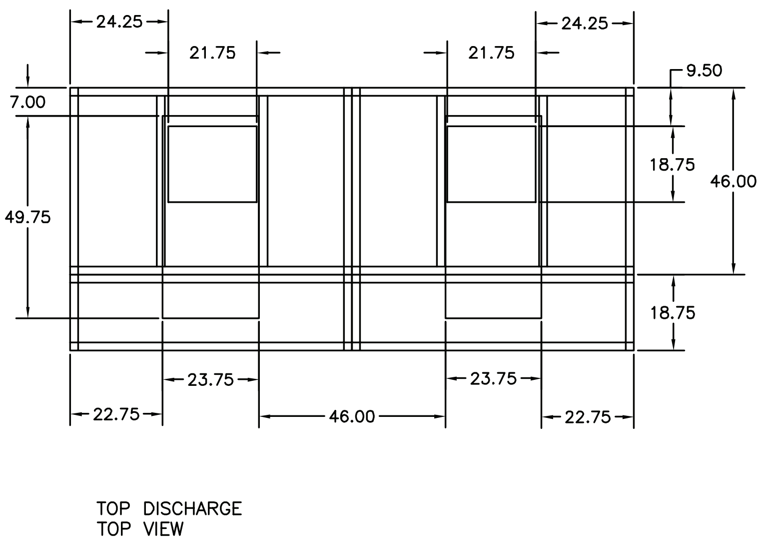
| | UNIT SIZE | 044 | 054 | 064 |
|---|---|---|---|---|
| A | WATER OUT | 2-1/2 in. FPT | 3 in. FPT | 3 in. FPT |
| B | WATER IN | 2-1/2 in. FPT | 3 in. FPT | 3 in. FPT |
| C | CONDENSATE DRAIN | 1-1/4 in. FPT | 1-1/4 in. FPT | 1-1/4 in. FPT |
| D | ECONOMIZER DRAIN | 1-1/4 in. FPT | 1-1/4 in. FPT | 1-1/4 in. FPT |

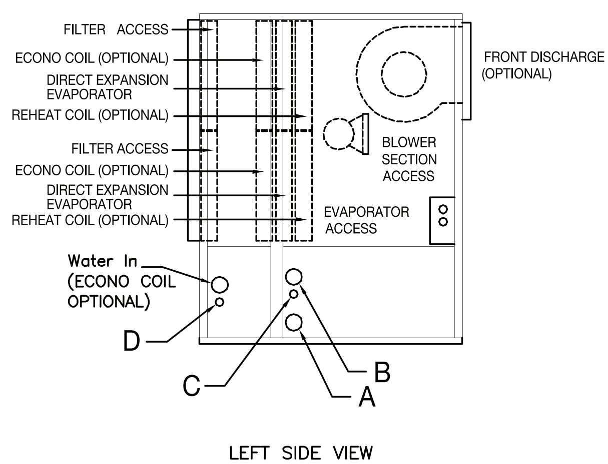
REPLACEMENT FILTERS : SIXTEEN (16) AT 17 x 27 x 4 INCHES.

**Fig. 6 — 50BVT,V,W044-064 (High-Boy) Dimensions**

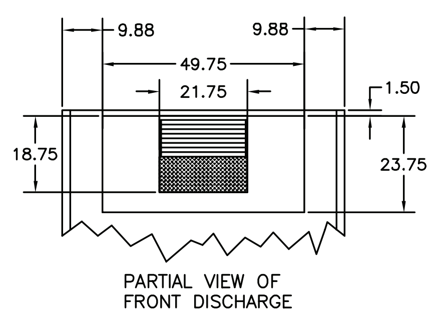



NOTES:
1. Dimensions in inches.
2. All units are rear return airflow configuration.
3. Recommended minimum service clearances are as follows:
   a. Front and rear — 30 in. (762 mm)
   b. Left and right sides — 65 in. (1651 mm) for coil removal

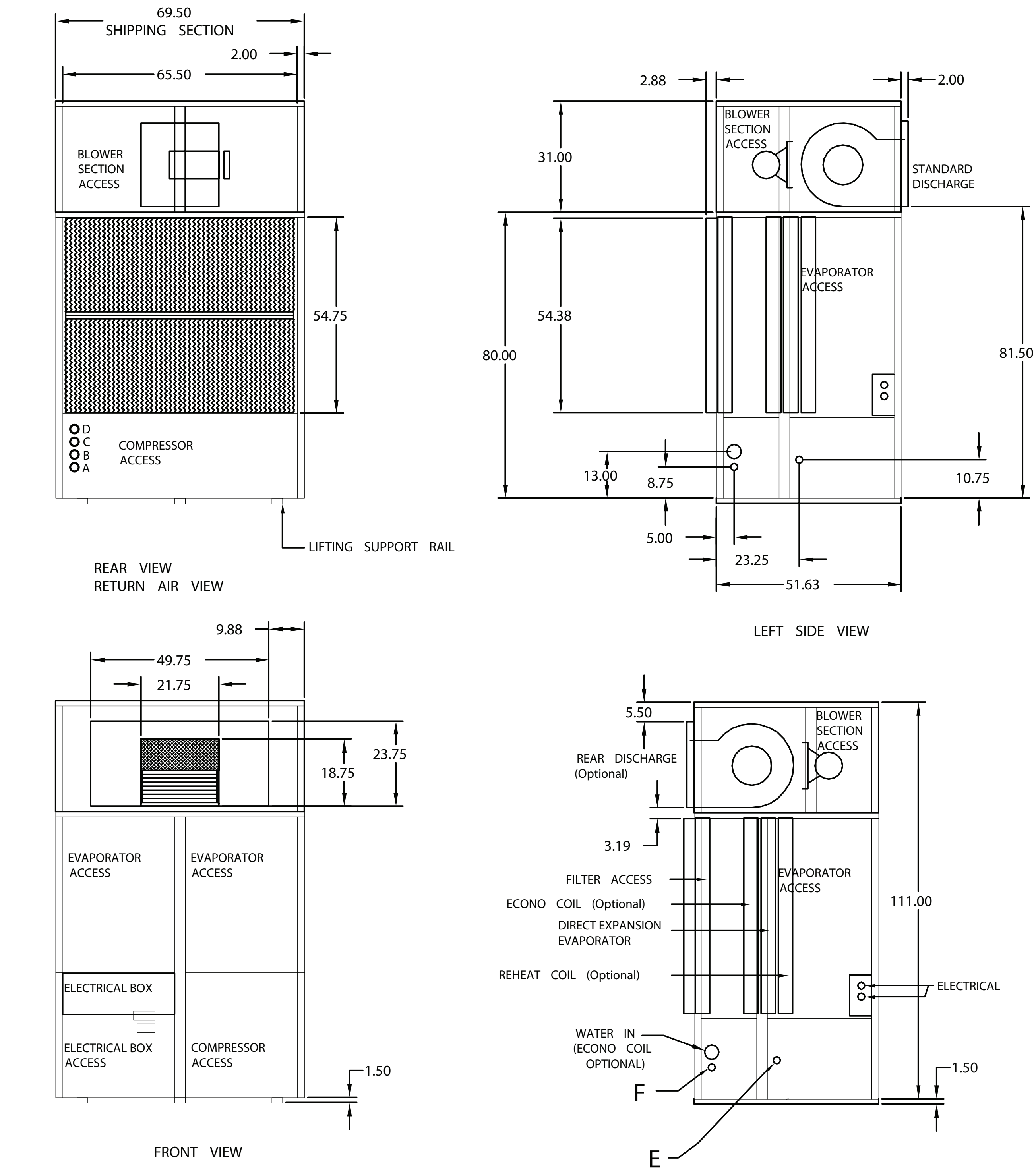



CONNECTIONS

| | UNIT SIZE | 044 | 054 | 064 |
|---|---|---|---|---|
| A | WATER OUT | 2-1/2 in. FPT | 3 in. FPT | 3 in. FPT |
| B | WATER IN | 2-1/2 in. FPT | 3 in. FPT | 3 in. FPT |
| C | CONDENSATE DRAIN | 1-1/4 in. FPT | 1-1/4 in. FPT | 1-1/4 in. FPT |
| D | ECONOMIZER DRAIN | 1-1/4 in. FPT | 1-1/4 in. FPT | 1-1/4 in. FPT |

REPLACEMENT FILTERS : SIXTEEN (16) AT 17 x 27 x 4 INCHES.

**Fig. 7 — 50BVT,V,W044-064 (Low-Boy) Dimensions**



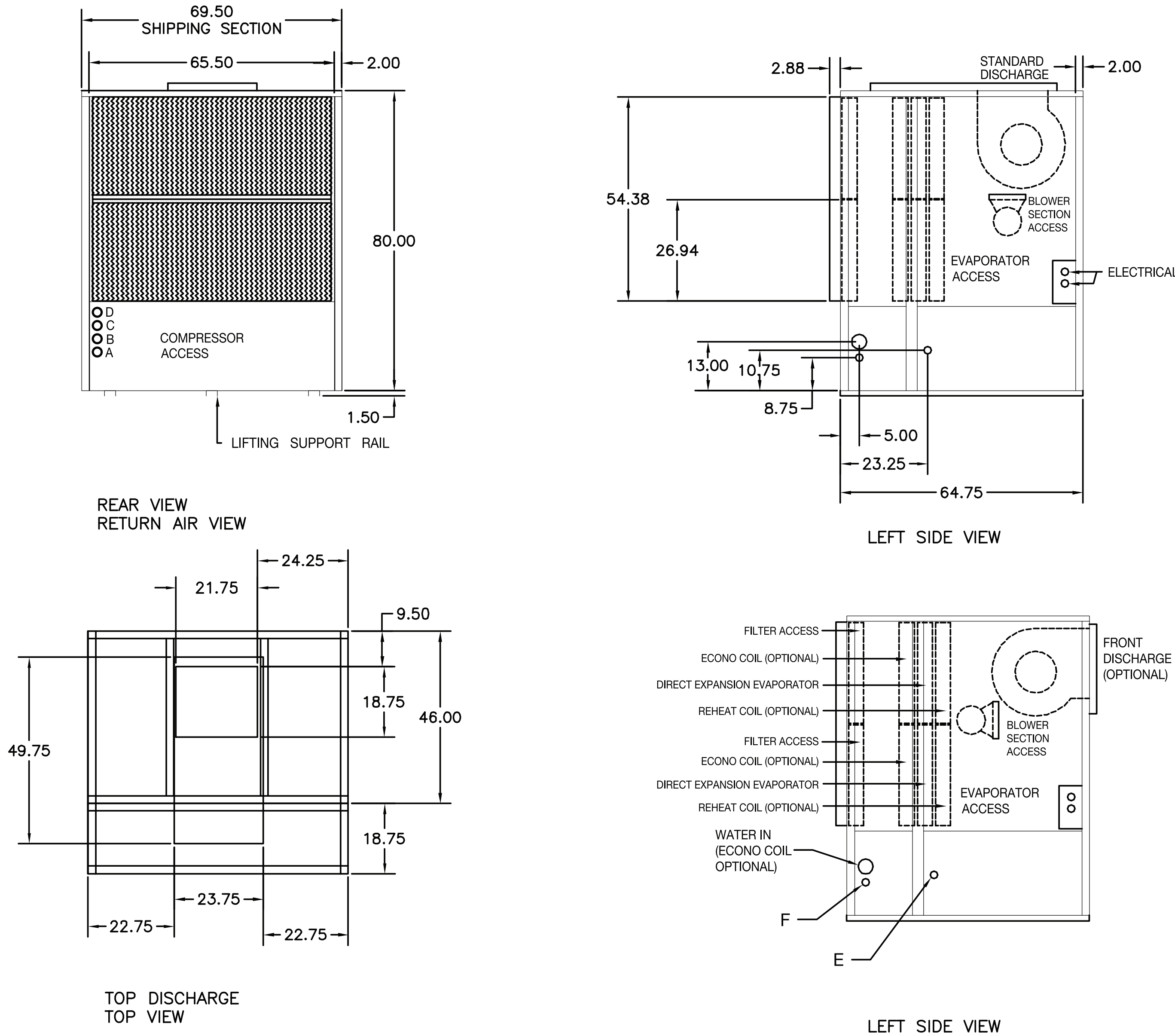

NOTES:
1. Dimensions in inches.
2. All units are rear return airflow configuration.
3. Constant volume units are available with front or rear air supply.
4. VAV units (50BVX) are available with rear supply only.
5. Recommended condenser match is ONE (1) 09DK034 (50/50 split).
6. Use proper piping practice for remote refrigerant connections. Refer to Carrier System Design Manual Part 3.
7. Recommended minimum service clearances are as follows:
   a. Front and rear — 30 in. (762 mm)
   b. Left or right side — 65 in. (1651 mm) for coil removal
   c. Side opposite coil removal — 20 in. (508 mm)

CONNECTIONS

| | | |
|---|---|---|
| A | LIQUID LINE CIRCUIT 1 | 7/8 in. OD |
| B | LIQUID LINE CIRCUIT 2 | 7/8 in. OD |
| C | DISCHARGE LINE CIRCUIT 1 | 1-1/8 in. OD |
| D | DISCHARGE LINE CIRCUIT 2 | 1-1/8 in. OD |
| E | CONDENSATE DRAIN | 1-1/4 in. FPT |
| F | ECONOMIZER DRAIN | 1-1/4 in. FPT |

REPLACEMENT FILTERS : EIGHT (8) AT 17 x 27 x 4 INCHES.

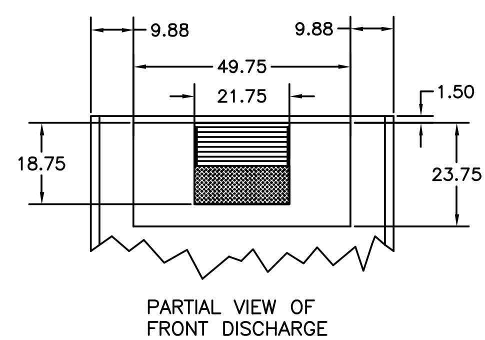
**Fig. 8 — 50BVU,X034 (High-Boy) Dimensions**




CONNECTIONS

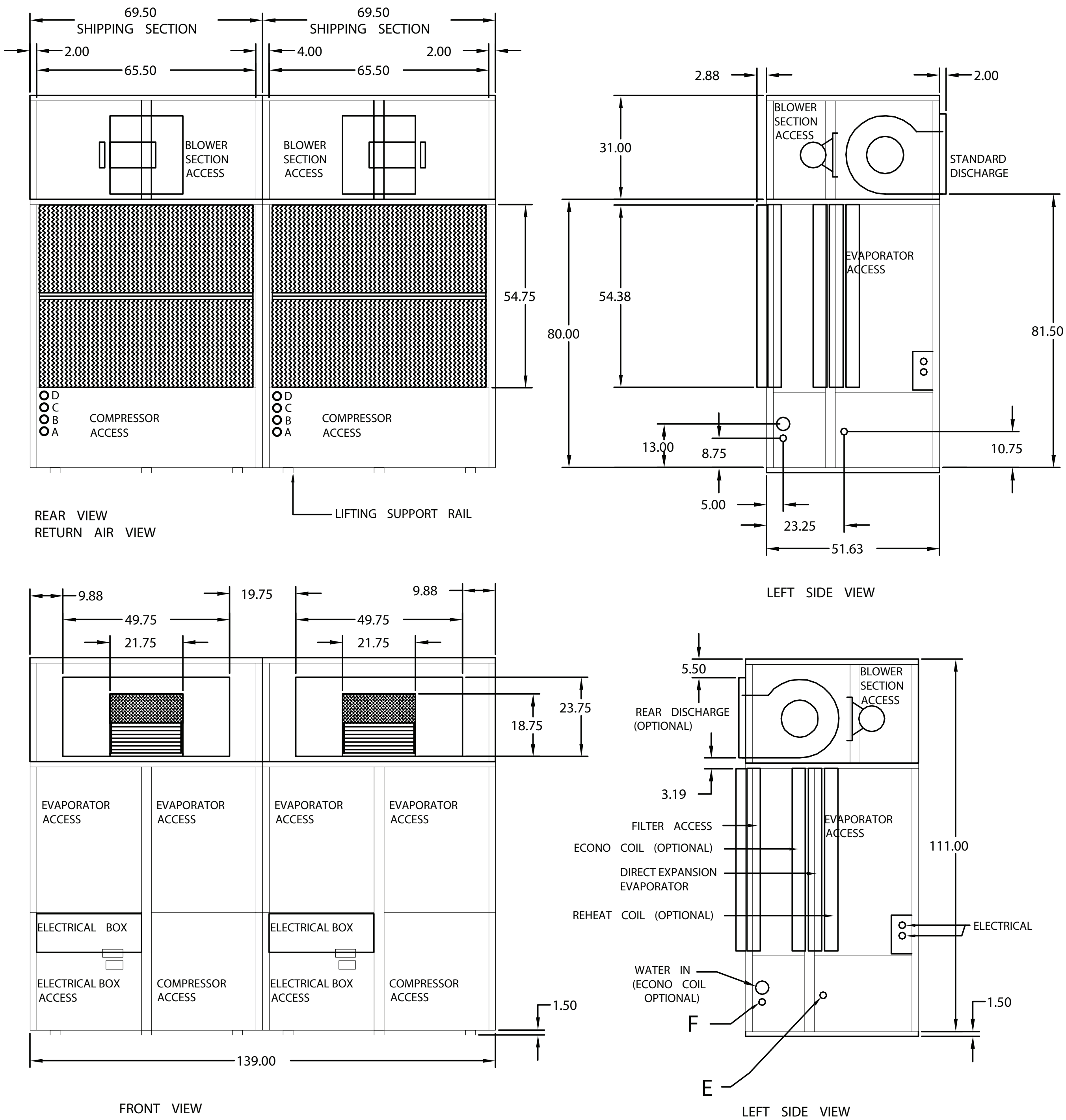
| | | |
|---|---|---|
| A | LIQUID LINE CIRCUIT 1 | 7/8 in. OD |
| B | LIQUID LINE CIRCUIT 2 | 7/8 in. OD |
| C | DISCHARGE LINE CIRCUIT 1 | 1-1/8 in. OD |
| D | DISCHARGE LINE CIRCUIT 2 | 1-1/8 in. OD |
| E | CONDENSATE DRAIN | 1-1/4 in. FPT |
| F | ECONOMIZER DRAIN | 1-1/4 in. FPT |

REPLACEMENT FILTERS : EIGHT (8) AT 17 x 27 x 4 INCHES.




NOTES:
1. Dimensions in inches.
2. All units are rear return airflow configuration.
3. Recommended condenser match is ONE (1) 09DK034 (50/50 split).
4. Use proper piping practice for remote refrigerant connections. Refer to Carrier System Design Manual Part 3.
5. Recommended minimum service clearances are as follows:
   a. Front and rear — 30 in. (762 mm)
   b. Left or right side — 65 in. (1651 mm) for coil removal
   c. Side opposite coil removal — 20 in. (508 mm)

**Fig. 9 — 50BVU,X034 (Low-Boy) Dimensions**



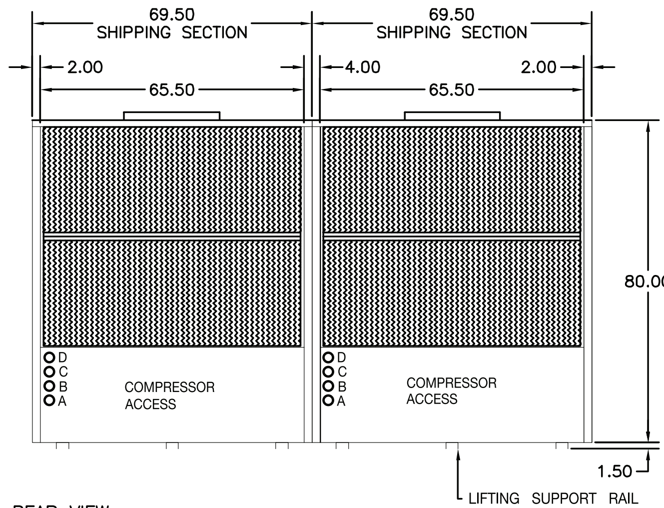

NOTES:
1. Dimensions in inches.
2. All units are rear return airflow configuration.
3. CV units are available with front or rear air supply.
4. VAV units (50BVX) are available with rear supply only.
5. Use proper piping practice for remote refrigerant connections. Refer to Carrier System Design Manual Part 3.
6. Recommended minimum service clearances are as follows:
   a. Front and rear — 30 in. (762 mm)
   b. Left and right sides — 65 in. (1651 mm) for coil removal

CONNECTIONS

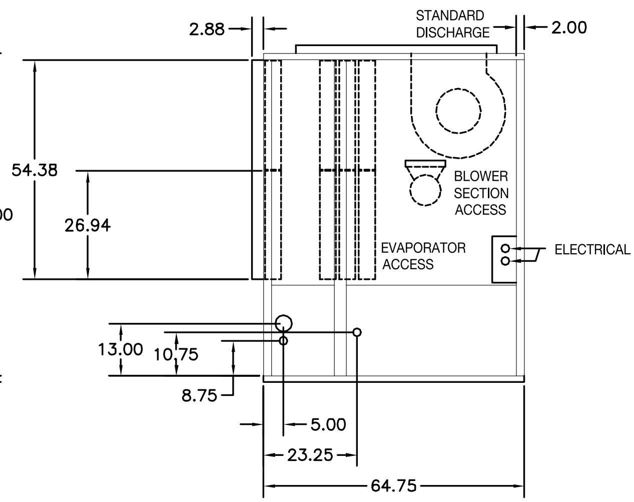
| | UNIT SIZE | 044 | 054 | 064 |
|---|---|---|---|---|
| A | LIQUID LINE CIRCUIT 1, 2 | 7/8 in. OD | 7/8 in. OD | 7/8 in. OD |
| B | LIQUID LINE CIRCUIT 3, 4 | 7/8 in. OD | 7/8 in. OD | 7/8 in. OD |
| C | DISCHARGE LINE CIRCUIT 1, 2 | 1-1/8 in. OD | 1-1/8 in. OD | 1-1/8 in. OD |
| D | DISCHARGE LINE CIRCUIT 3, 4 | 1-1/8 in. OD | 1-1/8 in. OD | 1-1/8 in. OD |
| E | CONDENSATE DRAIN | 1-1/4 in. FPT | 1-1/4 in. FPT | 1-1/4 in. FPT |
| F | ECONOMIZER DRAIN | 1-1/4 in. FPT | 1-1/4 in. FPT | 1-1/4 in. FPT |

REPLACEMENT FILTERS : SIXTEEN (16) AT 17 x 27 x 4 INCHES.

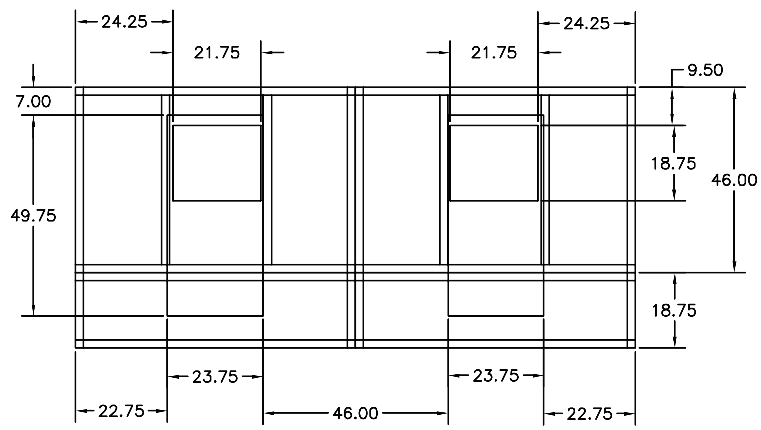
**Fig. 10 — 50BVU,X044-064 (High-Boy) Dimensions**



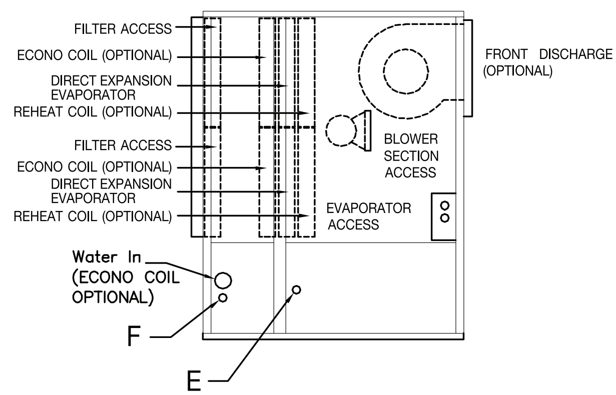

REAR VIEW
RETURN AIR VIEW



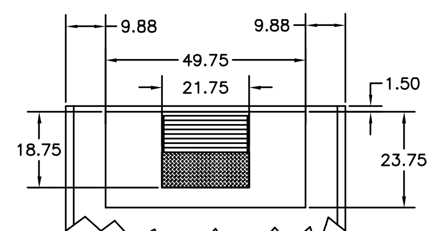

LEFT SIDE VIEW




TOP DISCHARGE
TOP VIEW




LEFT SIDE VIEW




PARTIAL VIEW OF
FRONT DISCHARGE

NOTES:
1. Dimensions in inches.
2. All units are rear return airflow configuration.
3. Use proper piping practice for remote refrigerant connections. Refer to Carrier System Design Manual Part 3.
4. Recommended minimum service clearances are as follows:
   a. Front and rear — 30 in. (762 mm)
   b. Left and right sides — 65 in. (1651 mm) for coil removal

CONNECTIONS

| | UNIT SIZE | 044 | 054 | 064 |
|---|---|---|---|---|
| A | LIQUID LINE CIRCUIT 1, 2 | 7/8 in. OD | 7/8 in. OD | 7/8 in. OD |
| B | LIQUID LINE CIRCUIT 3, 4 | 7/8 in. OD | 7/8 in. OD | 7/8 in. OD |
| C | DISCHARGE LINE CIRCUIT 1, 2 | 1-1/8 in. OD | 1-1/8 in. OD | 1-1/8 in. OD |
| D | DISCHARGE LINE CIRCUIT 3, 4 | 1-1/8 in. OD | 1-1/8 in. OD | 1-1/8 in. OD |
| E | CONDENSATE DRAIN | 1-1/4 in. FPT | 1-1/4 in. FPT | 1-1/4 in. FPT |
| F | ECONOMIZER DRAIN | 1-1/4 in. FPT | 1-1/4 in. FPT | 1-1/4 in. FPT |

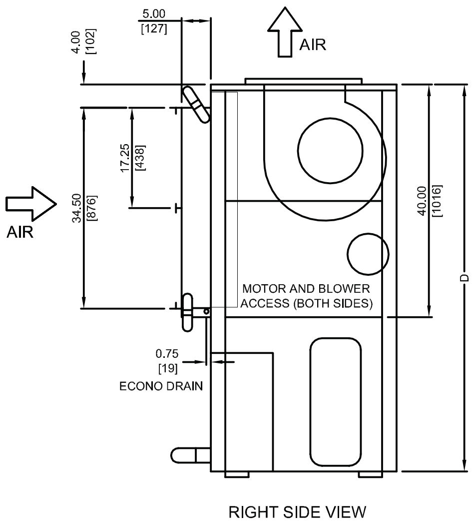
REPLACEMENT FILTERS : SIXTEEN (16) AT 17 x 27 x 4 INCHES.

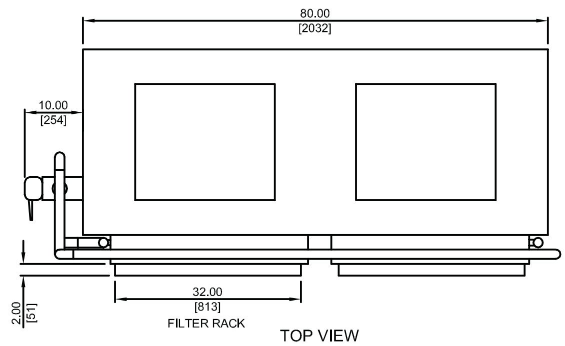
**Fig. 11 — 50BVU,X044-064 (Low-Boy) Dimensions**

NOTES:
1. Dimensions in inches [mm].
2. Refer to base unit certified drawing for additional unit dimensions, service clearance, and alternate airflow configurations.

FRONT RETURN, TOP SUPPLY SHOWN

| | 50BV(C)(Q)(J) UNIT NOMINAL SIZE | | |
|---|---|---|---|
| | 020 | 024 | 028 |
| A | 28.00 [711] | 32.00 [813] | 32.00 [813] |
| B | 31.00 [787.4] | 35.00 [889] | 35.00 [889] |
| C | 17.50 [445] | 18.75 [476] | 18.75 [476] |
| D | 62.00 [1575] | 66.50 [1689] | 66.50 [1689] |
| WATER CONN. | 2" FPT | 2" FPT | 2" FPT |
| CONDENSATE CONN. | 1-1/4" FPT | 1-1/4" FPT | 1-1/4" FPT |
| FILTER QTY. & SIZE | (4) 17 x 34-1/2 x 1" | (4) 17x 34-1/2 x 1" | (4) 17x 34-1/2 x 1" |



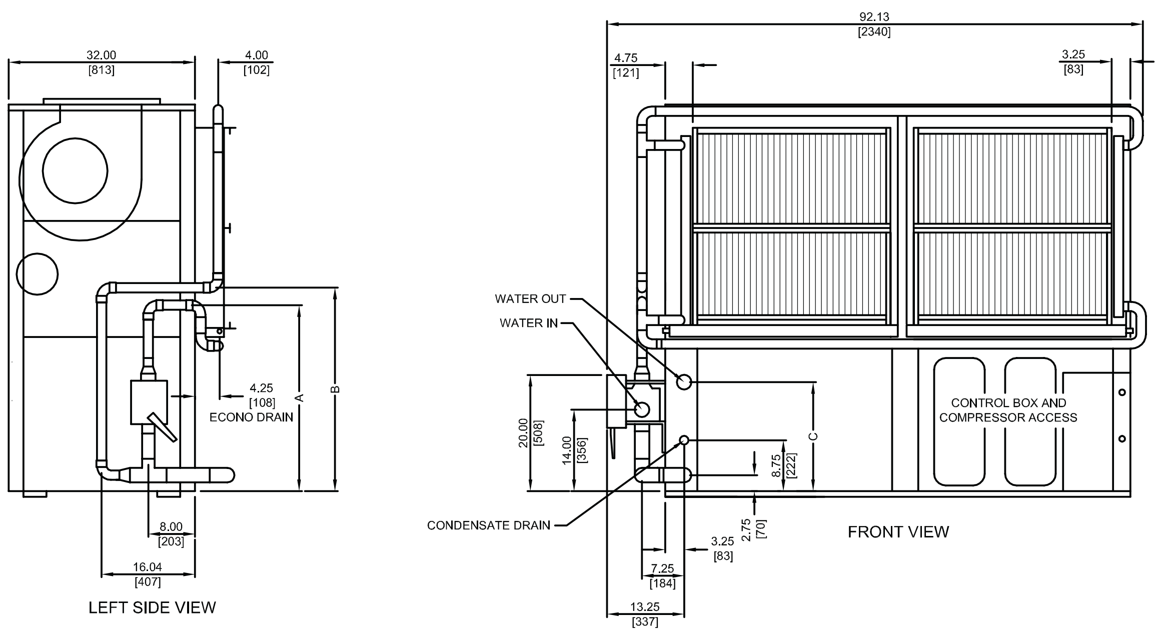




**Fig. 12 — 50BVC,J,Q020-028 with Optional Waterside Economizer Dimensions**

NOTES:
1. Dimensions in inches [mm].
2. Refer to base unit certified drawing for additional unit dimensions, service clearances, and alternate airflow configurations.

| 50BV(C)(Q)(J) 034 | |
|---|---|
| DESCRIPTION | SIZE |
| WATER CONN. | 2" FPT |
| CONDENSATE CONN. | 1-1/4" FPT |
| FILTER QTY. & SIZE | (4) 27" x 34-1/2" x 1" |

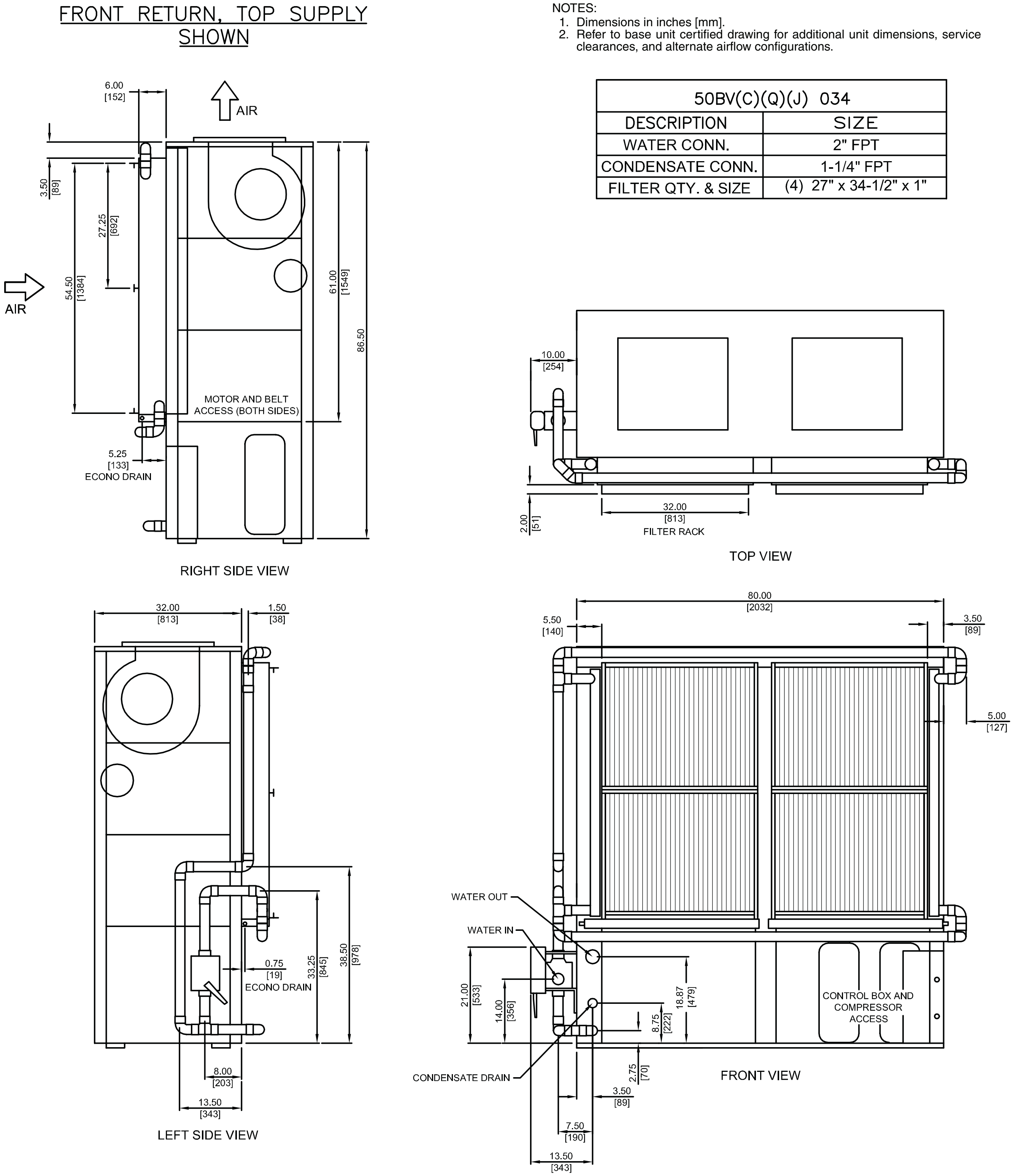
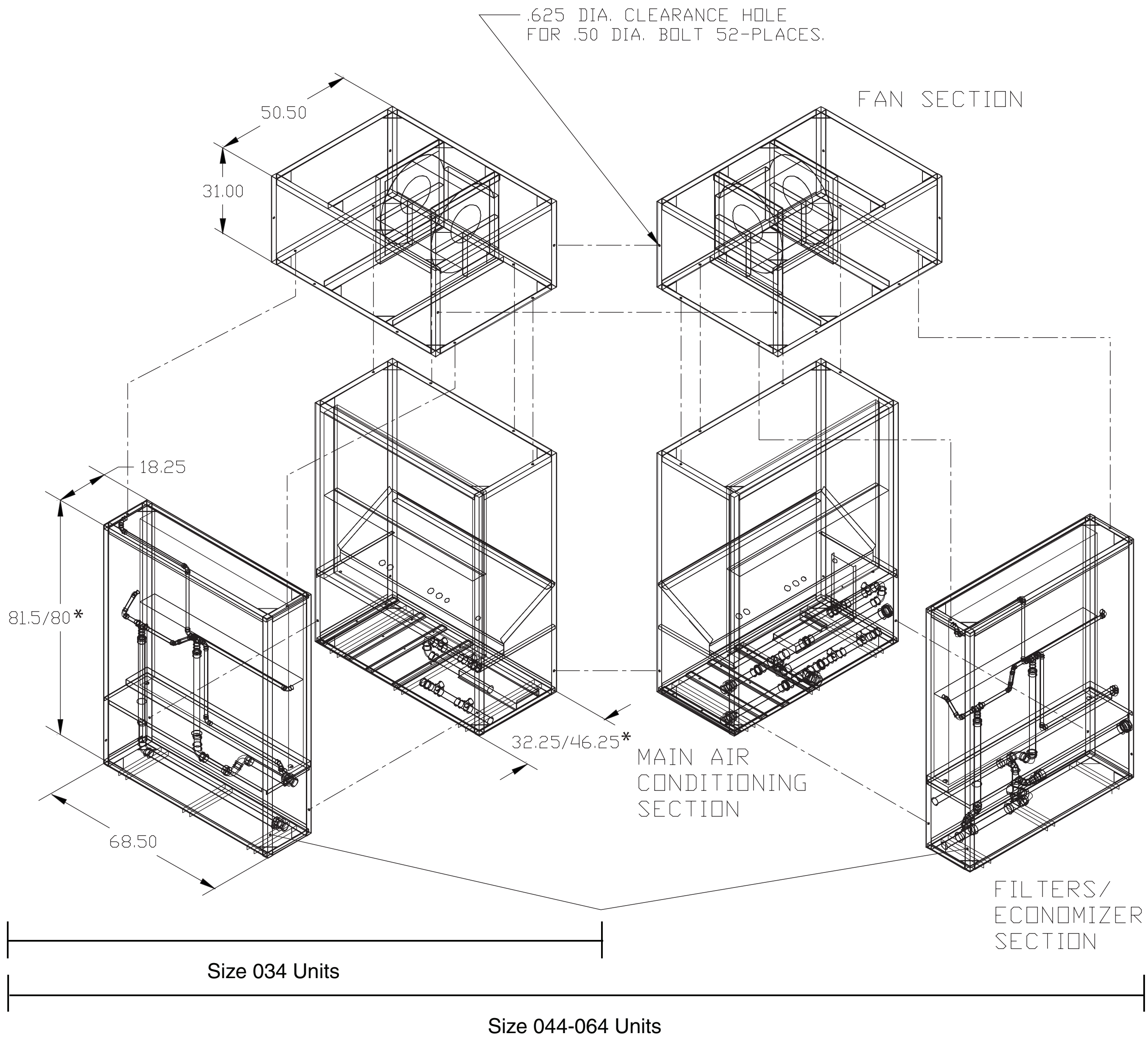



**Fig. 13 — 50BVC,J,Q034 with Optional Waterside Economizer Dimensions**




**Shipping Weights (lb)**

| 50BVT,U,V,W,X UNIT | HIGH-BOY UNIT | | | | LOW-BOY UNIT | | | |
|---|---|---|---|---|---|---|---|---|
| | 034 | 044 | 054 | 064 | 034 | 044 | 054 | 064 |
| **MAIN AIR CONDITIONING SECTION (EACH)** | | | | | | | | |
| **NUMBER OF SECTIONS** | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 2 |
| **SECTION WEIGHT** | 1450 | 1175 | 1550 | 1575 | 2100 | 1825 | 2200 | 2225 |
| **REHEAT COIL OPTION** | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| **FILTER/ECONOMIZER SECTION (EACH)** | | | | | | | | |
| **NUMBER OF SECTIONS** | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 2 |
| **FILTER SECTION** | 310 | 310 | 310 | 310 | 310 | 310 | 310 | 310 |
| **ECONOMIZER OPTION** | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| **FAN SECTION (EACH)** | | | | | | | | |
| **NUMBER OF SECTIONS** | 1 | 2 | 2 | 2 | INCLUDED IN AIR CONDITIONING SECTION | | | |
| **FAN SECTION** | 650 | 650 | 650 | 650 | | | | |
| **TOTAL UNIT** | | | | | | | | |
| **NUMBER OF SECTIONS** | 3 | 6 | 6 | 6 | 2 | 4 | 4 | 4 |
| **UNIT WITH OPTIONS** | 2650 | 4750 | 5500 | 5550 | 2650 | 4750 | 5500 | 5550 |

*High-boy/low-boy.

**Fig. 14 — Modular Shipping Weights — 50BVT,U,V,W,X**

## Table 3A — Physical Data — 50BVC,E,J,K,Q

| UNIT 50BVC,E,J,K,Q | 020 | 024 | 028 | 034 |
|---|---|---|---|---|
| **NOMINAL CAPACITY (Tons)** | 18 | 20 | 25 | 30 |
| **OPERATING WEIGHT (lb)** | | | | |
| **50BVC,Q…50BVJ** | 1192…1227 | 1378…1413 | 1428…1473 | 1680…1725 |
| **50BVE…50BVK** | 1110…1145 | 1290…1325 | 1320…1365 | 1520…1565 |
| **COMPRESSOR** | Copeland Scroll | | | |
| **Quantity** | 2 | 2 | 2 | 2 |
| **Number of Refrigerant Circuits** | 2 | 2 | 2 | 2 |
| **Oil (ounces) Ckt 1…Ckt 2** | 85…85 | 110…110 | 110…110 | 140…140 |
| **REFRIGERANT TYPE** | R-22 or R-410A | | | |
| **Expansion Device** | TXV | TXV | TXV | TXV |
| **Operating Charge (lb) Ckt 1…Ckt 2** | 8.1…8.1 | 9.1…9.1 | 9.1…9.1 | 18.0…18.0 |
| **CONDENSER (50BVC,Q,J only)** | Tube-in-Tube Coaxial | | | |
| **Quantity of Manifolded Circuits** | 2 | 2 | 2 | 2 |
| **Nominal Flow Rate (GPM)** | 54 | 60 | 75 | 90 |
| **Water Flow Range (GPM)** | 36-72 | 40-80 | 50-100 | 60-120 |
| **Max. Water Working Pressure (PSIG)** | 400 | 400 | 400 | 400 |
| **Max. Refrig. Working Pressure (PSIG)** | 450 (600*) | 450 (600*) | 450 (600*) | 450 (600*) |
| **Min. Entering Water Temp. (°F)** | 50 | 50 | 50 | 50 |
| **Max. Entering Water Temp. (°F)** | 110 | 110 | 110 | 110 |
| **Waterside Volume (gal)** | 3.6 | 4.0 | 5.0 | 6.0 |
| **EVAPORATOR COIL** | | | | |
| **Rows…Fins/in.** | 3…14 | 3…14 | 3…14 | 3…14 |
| **Total Face Area (sq ft)** | 18.1 | 18.1 | 18.1 | 22.0 |
| **EVAPORATOR FAN** | | | | |
| **Quantity…Size** | 2…15x15 | 2…15x15 | 2…15x15 | 2…15x15 |
| **Type Drive** | Belt | Belt | Belt | Belt |
| **Nominal CFM** | 7200 | 8000 | 10,000 | 12,000 |
| **Std Motor Qty…HP…Frame Size** | 2…1.5…56 | 2…2…56H | 2…3…56HZ | 2…5…56HZ |
| **Alt 1 Motor Qty…HP…Frame Size** | 2…2…56H | 2…3…56HZ | 2…5…56HZ | — |
| **Alt 2 Motor Qty…HP…Frame Size** | 2…3…56HZ | 2…5…56HZ | — | — |
| **Alt 3 Motor Qty…HP…Frame Size** | 2…5…56HZ | — | — | — |
| **Motor Nominal RPM (1.5, 2, 3, HP)** | 1725 | 1725 | 1725 | — |
| **Motor Nominal RPM (5 HP)** | 3450 | 3450 | 3450 | 3450 |
| **Fan Drive RPM Range** | | | | |
| **Std Fan Drive (1.5, 2, 3 HP)** | 753-952 | 753-952 | 753-952 | — |
| **Std Fan Drive (5 HP)** | 967-1290 | 967-1290 | 967-1290 | 967-1290 |
| **Med Static Fan Drive (1.5, 2, 3 HP)** | 872-1071 | 872-1071 | 872-1071 | — |
| **Motor Bearing Type** | Ball | Ball | Ball | Ball |
| **Maximum Allowable RPM** | 1300 | 1300 | 1300 | 1300 |
| **Motor Pulley Pitch Diameter** | | | | |
| **Std Fan Drive (1.5, 2, 3 HP)** | 3.7-4.7 | 3.7-4.7 | 3.7-4.7 | — |
| **Std Fan Drive (5 HP)** | 2.9-3.9 | 2.9-3.9 | 2.9-3.9 | 2.9-3.9 |
| **Med Static Fan Drive (1.5, 2, 3 HP)** | 4.3-5.3 | 4.3-5.3 | 4.3-5.3 | — |
| **Motor Shaft Diameter (in.) (1.5, 2 HP)** | 5/8 | 5/8 | — | — |
| **Motor Shaft Diameter (in.) (3, 5 HP)** | 7/8 | 7/8 | 7/8 | 7/8 |
| **Belt, Qty…Type…Length (in.)** | | | | |
| **Std Fan Drive (1.5, 2 HP)** | 1…B…39 | 1…B…39 | — | — |
| **Std Fan Drive (3 HP)** | 2…B…39 | 2…B…39 | 2…B…39 | — |
| **Std Fan Drive (5 HP)** | 2...BX…42 | 2...BX…42 | 2...BX…42 | 2...BX…42 |
| **Med Static Fan Drive (1.5, 2 HP)** | 1…B…40 | 1…B…40 | — | — |
| **Med Static Fan Drive (3 HP)** | 2…B…40 | 2…B…40 | 2…B…40 | — |
| **Pulley Center Line Distance (in.)** | 10.1…10.9 | 10.1…10.9 | 10.1…10.9 | 10.1…10.9 |
| **Speed Change Per Full Turn of Moveable Pulley Flange (RPM)** | | | | |
| **Std Fan Drive (1.5, 2, 3 HP)** | 33 | 33 | 33 | — |
| **Std Fan Drive (5 HP)** | 54 | 54 | 54 | 54 |
| **Med Static Fan Drive (1.5, 2, 3 HP)** | 33 | 33 | 33 | — |
| **Fan Shaft Diameter (in.)** | 1 | 1 | 1 | 1 |
| **HIGH PRESSURE SWITCHES (PSIG)** | | | | |
| **Cutout** | 380 (420*) ± 10 | 380 (420*) ± 10 | 380 (420*) ± 10 | 380 (420*) ± 10 |
| **Reset (Auto)** | 300 (420*) ± 15 | 300 (420*) ± 15 | 300 (420*) ± 15 | 300 (420*) ± 15 |
| **LOW PRESSURE SWITCHES (PSIG)** | | | | |
| **Cutout** | 20 (40*) ± 3 | 20 (40*) ± 3 | 20 (40*) ± 3 | 20 (40*) ± 3 |
| **Reset (Auto)** | 40 (60*) ± 5 | 40 (60*) ± 5 | 40 (60*) ± 5 | 40 (60*) ± 5 |
| **REMOTE REFRIGERANT CONNECTIONS (50BVE,K Only)** | | | | |
| **Discharge (Hot Gas) Connection (in.) Qty…Size** | 2…1 1/8 | 2…1 1/8 | 2…1 1/8 | 2…1 1/8 |
| **Liquid Connection (in.) Qty…Size** | 2…7/8 | 2…7/8 | 2…7/8 | 2…7/8 |
| **RETURN AIR FILTERS** | | | | |
| **Quantity…Size (in.)** | 4…20x34.5x1 | 4…20x34.5x1 | 4…20x34.5x1 | 4…30x34.5x1 |

LEGEND

**TXV** — Thermostatic Expansion Valve

*R-410A models.

## Table 3B — Physical Data — 50BVT,U,V,W,X

| UNIT 50BVT,U,V,W,X | 034 | 044 | 054 | 064 |
|---|---|---|---|---|
| **NOMINAL CAPACITY (Tons)** | 30 | 40 | 50 | 60 |
| **OPERATING WEIGHT (lb)** | | | | |
| 50BVT,V…50BVW | 2580…2645 | 4334…4404 | 5198…5298 | 5230…5330 |
| 50BVU…50BVX | 2420…2485 | 4094…4164 | 4938…5038 | 4970…5070 |
| **COMPRESSOR** | Copeland Scroll | | | |
| Quantity | 2 | 4 | 4 | 4 |
| Number of Refrigerant Circuits | 2 | 4 | 4 | 4 |
| Oil (oz.) | | | | |
| Circuit 1…Circuit 2 | 140…140 | 110…110 | 140…140 | 140…140 |
| Circuit 3…Circuit 4 | — | 110…110 | 140…140 | 140…140 |
| **REFRIGERANT TYPE** | R-22 | | | |
| Expansion Device | TXV | TXV | TXV | TXV |
| Operating Charge (lb) | | | | |
| Circuit 1…Circuit 2 | 18.0…18.0 | 10.0…10.0 | 18.0…18.0 | 18.0…18.0 |
| Circuit 3…Circuit 4 | — | 10.0…10.0 | 18.0…18.0 | 18.0…18.0 |
| **CONDENSER (50BVT,V,W only)** | Tube-in-Tube Coaxial | | | |
| Quantity of Manifolded Circuits | 2 | 4 | 4 | 4 |
| Nominal Flow Rate (GPM) | 90 | 120 | 150 | 180 |
| Water Flow Range (GPM) | 60-120 | 80-160 | 100-200 | 120-240 |
| Max. Water Working Pressure (PSIG) | 400 | 400 | 400 | 400 |
| Max. Refrig. Working Pressure (PSIG) | 450 | 450 | 450 | 450 |
| Min. Entering Water Temp. (°F) | 50 | 50 | 50 | 50 |
| Max. Entering Water Temp. (°F) | 110 | 110 | 110 | 110 |
| Waterside Volume (gal) | 6.0 | 9.0 | 11.3 | 13.5 |
| **EVAPORATOR COIL** | | | | |
| Rows…Fins/in. | 4…12 | 3…12 | 4…12 | 4…12 |
| Total Face Area (sq ft) | 23.2 | 46.4 | 46.4 | 46.4 |
| **EVAPORATOR FAN** | | | | |
| Quantity…Size | 1…18x18 | 2…18x18 | 2…18x18 | 2…18x18 |
| Type Drive | Belt | Belt | Belt | Belt |
| Nominal CFM | 12,000 | 16,000 | 20,000 | 24,000 |
| Motor Option 1 Qty…HP…Frame Size | 1…7.5…213T | 2…7.5…213T | 2…7.5…213T | 2…7.5…213T |
| Motor Option 2 Qty…HP…Frame Size | 1…10…215T | 2…10…215T | 2…10…215T | 2…10…215T |
| Motor Option 3 Qty…HP…Frame Size | 1…15…254T | 2…15…254T | 2…15…254T | 2…15…254T |
| Motor Option 4 Qty…HP…Frame Size | 1…20…256T | — | 2…20…256T | 2…20…256T |
| Motor Nominal RPM | 1750 | 1750 | 1750 | 1750 |
| Fan Drive RPM Range | | | | |
| Standard (7.5 HP) | 780-960 | 780-960 | 780-960 | 780-960 |
| Standard (10, 15, 20 HP), Med Static (7.5 HP) | 805-991 | 805-991 | 805-991 | 805-991 |
| Med Static (10, 15, 20 HP), High Static (7.5 HP) | 960-1146 | 960-1146 | 960-1146 | 960-1146 |
| High Static (10, 15, 20 HP) | 1119-1335 | 1119-1335 | 1119-1335 | 1119-1335 |
| Motor Bearing Type | Ball | Ball | Ball | Ball |
| Maximum Allowable RPM | 1450 | 1450 | 1450 | 1450 |
| Motor Pulley Pitch Diameter | | | | |
| Std Fan Drive (7.5 HP) | 5.2-6.4 | 5.2-6.4 | 5.2-6.4 | 5.2-6.4 |
| Std Fan Drive (10, 15, 20 HP), Med Static (7.5 HP) | 4.8-6.0 | 4.8-6.0 | 4.8-6.0 | 4.8-6.0 |
| Med Static Fan Drive (10, 15, 20 HP), High Static (7.5 HP) | 5.8-7.0 | 5.8-7.0 | 5.8-7.0 | 5.8-7.0 |
| High Static Fan Drive (10, 15, 20 HP) | 5.8-7.0 | 5.8-7.0 | 5.8-7.0 | 5.8-7.0 |
| Motor Shaft Diameter (in.) (7.5, 10 HP) | 1 3/8 | 1 3/8 | 1 3/8 | 1 3/8 |
| Motor Shaft Diameter (in.) (15, 20 HP) | 1 5/8 | 1 5/8 | 1 5/8 | 1 5/8 |
| Belt, Qty…Type…Length (in.) | | | | |
| Std Fan Drive (7.5 HP) | 2…B…48 | 2...B…48 | 2…B…48 | 2…B…48 |
| Std Fan Drive (10, 15, 20 HP), Med Static (7.5 HP) | 2…B…46 | 2…B…46 | 2…B…46 | 2…B…46 |
| Med Static Fan Drive (10, 15, 20 HP), High Static 7.5 HP) | 2…B…48 | 2…B…48 | 2…B…48 | 2…B…48 |
| High Static Fan Drive (10, 15, 20 HP) | 2…B…45 | 2…B…45 | 2…B…45 | 2…B…45 |
| Pulley Center Line Distance (in.) | 10.2-11.4 | 10.2-11.4 | 10.2-11.4 | 10.2-11.4 |
| Speed Change Per Full Turn of Moveable Pulley Flange (RPM) | | | | |
| Std Fan Drive (7.5 HP) | 36 | 36 | 36 | 36 |
| Std Fan Drive (10, 15, 20 HP), Med Static (7.5 HP) | 31 | 31 | 31 | 31 |
| Med Static Fan Drive (10, 15, 20 HP), High Static (7.5 HP) | 31 | 31 | 31 | 31 |
| High Static Fan Drive (10, 15, 20 HP) | 36 | 36 | 36 | 36 |
| Fan Shaft Diameter (in.) | 1 7/16 | 1 7/16 | 1 7/16 | 1 7/16 |
| **HIGH PRESSURE SWITCHES (PSIG)** | | | | |
| Cutout | 380 ± 10 | 380 ± 10 | 380 ± 10 | 380 ± 10 |
| Reset (Auto) | 300 ± 15 | 300 ± 15 | 300 ± 15 | 300 ± 15 |
| **LOW PRESSURE SWITCHES (PSIG)** | | | | |
| Cutout | 20 ± 3 | 20 ± 3 | 20 ± 3 | 20 ± 3 |
| Reset (Auto) | 40 ± 5 | 40 ± 5 | 40 ± 5 | 40 ± 5 |
| **REMOTE REFRIGERANT CONNECTIONS (50BVU,X Only)** | | | | |
| Discharge (Hot Gas) Connection (in.) Qty…Size | 2…1 1/8 | 4…1 1/8 | 4…1 1/8 | 4…1 1/8 |
| Liquid Connection (in.) Qty…Size | 2…7/8 | 4…7/8 | 4…7/8 | 4…7/8 |
| **RETURN AIR FILTERS** | | | | |
| Quantity…Size (in.) | 8…17x27x4 | 16…17x27x4 | 16…17x27x4 | 16…17x27x4 |

ACOUSTICAL CONSIDERATIONS — Proper acoustical considerations are a critical part of every system's design and operation. Each system design and installation should be reviewed for its own unique requirements. For job specific requirements, contact an acoustical consultant for guidance and recommendations.

In general, to reduce noise, consider the following:

- Locate mechanical room and ducts away from noise sensitive locations. Whenever possible, work with the architect to locate the equipment rooms around the perimeters of restrooms, hallways, fire escapes, stair wells, etc., to reduce noise transmission. This allows not only for isolation from radiated sound but also enables the contractor to route duct systems around sensitive locations.
- Construct the equipment room of concrete block or use a double offset stud wall with interwoven insulation. Seal all penetrations.
- Design the system for low total static pressure.
- Use suitable vibration isolation pads or isolation springs according to the design engineer's specifications.
- A flexible canvas duct connector is recommended on both the supply and return air sides of units to be connected to system ductwork.
- Use a minimum of 15 ft of return ductwork between the last air terminal or diffuser and the unit.
- Insulate supply and return ducts with 2-in., 3-lb density insulation.
- Round duct is recommended. If rectangular ductwork is used, keep aspect ratios as small as possible (i.e., as close to square as possible).
- Avoid any direct line of sight from return air grilles into the unit's return. If return air is to be ducted to an equipment room, an elbow should be installed within the equipment room.
- Running a return air drop to near the floor of the room will aid in sound attenuation.
- Do not exceed the recommended supply duct velocity of 2,000 fpm.
- Do not exceed the recommended return duct velocity of 1,000 fpm.
- Use turning vanes on 90-degree elbows.
- Place isolation springs under each corner and under each compressor if utilized.

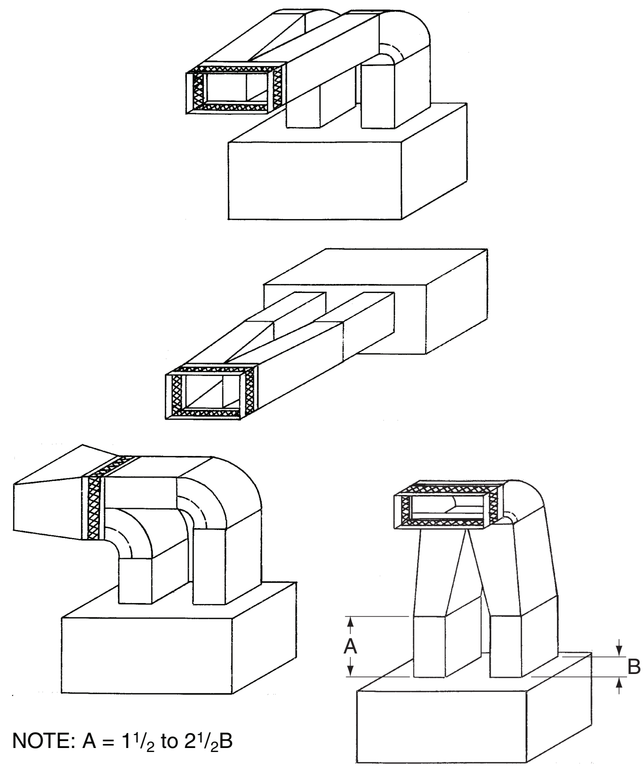
ASSEMBLING MODULAR UNITS — 50BVT,U,V,W,X 30 to 60 ton units ship in the number of pieces shown in Table 2. Reassemble the unit. Use the loose hardware provided in the main air-conditioning section and the instructions below.

1. The filter/economizer section ships bolted to the main air-conditioning section and can be removed in the field. When reattaching the filter/economizer section to the main air-conditioning section, place the filter side of the filter/economizer section facing out and away from the main air conditioning section.
2. If the unit has 2 filter/economizer and 2 main air-conditioning sections (40 through 60 ton units), bolt the remaining filter/economizer section and main air-conditioning section together, as in Step 1.
3. For units with 2 filter/economizer and 2 main air-conditioning sections, use the provided unions to assemble the water connections between the 2 additional sections joined in Step 2.
4. For units with multiple air conditioning sections, connect the condensate drain hoses from the "B" side of the unit to the drain manifold on the "A" side of the unit.
5. For unit sizes 044-064, connect power wiring from the main terminal block in the "A" side of the unit to the power terminal block in the "B" side of the unit.
6. For VAV units only, connect the plenum tubing, coiled behind the VAV control panel, to the bulkhead fittings located in the discharge of the supply fan. This connects the high pressure supply to the high side of the duct high static pressure switch.

**⚠ CAUTION**

Remove all shipping blocks, if any, under blower housing or damage to the fan may occur.

**Step 3 — Install Ductwork —** The VAV units must use a "pair of pants" configuration as shown in Fig. 15. Refer to the Carrier System Design Manual or ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) standards for the recommended duct connection to unit with 2 fans.




NOTE: A = $1^1/_2$ to $2^1/_2$B

**Fig. 15 — Typical Fan Discharge Connections for Multiple Fan Units**

A supply air outlet collar and return air duct flange are provided on all units to facilitate duct connections. Refer to dimensional drawings (Fig. 2-14) for connection sizes and locations.

A flexible canvas duct connector is recommended on both supply and return air sides of the units to be connected to the system ductwork.

All metal ductwork should be adequately insulated to avoid heat loss or gain and to prevent condensation from forming on the duct walls. Uninsulated ductwork is not recommended, as the unit's performance will be adversely affected.

Do not connect discharge ducts directly to the blower outlet(s). The factory filter should be left in place on a free return system.

If the unit will be installed in a new installation, the duct system should be designed in accordance with the System Design Manual, Part 2 and with ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) procedures for duct sizing. If the unit will be connected to an existing duct system, check that the existing duct system has the capacity to handle the required airflow for the unit application at an

acceptable system static pressure. If the existing duct system is too small, larger ductwork must be installed.

The duct system and diffusers should be sized to handle the design airflow volumes quietly. To maximize sound attenuation of the unit's blower(s), the supply and return air plenums should be insulated for a length of at least 15 ft from the unit. Direct line of sight from return air grilles into the unit's return should be avoided. If return air is to be ducted to an equipment room, an elbow should be installed within the equipment room. Running a return air drop to near the floor of the room will aid in sound attenuation. Avoid transmitting vibrations generated by the movement of air in the ducting to the walls of the building. This is especially important where ductwork penetrates walls. The maximum recommended return air velocity is 1,000 fpm. Lower return air velocities will result in lower sound power levels. The use of round supply duct plenums should be considered, as it will significantly reduce low frequency sound at the equipment room. If rectangular supply plenums are used, the aspect ratio of the duct should be kept as small as possible (i.e., as close to square as possible). The large, flat surface areas associated with large aspect ratio duct systems will transmit sound to the space, and the potential for duct-generated noise is increased. The maximum recommended supply air duct velocity is 2,000 fpm.

Units with two fans should have a properly designed "pair of pants" duct connection. An adequate straight length of ducting from the unit should be allowed before elbows are installed. If connecting an elbow directly to the fan outlet, a minimum straight length of 2 fan diameters from the fan outlet is recommended. Elbows should turn in the direction of fan rotation, if possible. Abrupt turns will generate air turbulence and excessive noise. Turning vanes should be used in all short radius bends. Ensure that ducting does not obstruct access to the unit for routine servicing.

DUCT STATIC PRESSURE PROBE AND TUBING (VAV Only) — On VAV systems, the duct static pressure sensor and tubing are field-mounted. The sensor tubing sensing point should be located near the end of the main supply trunk duct in a position free from turbulence effects and at least 10 duct diameters downstream and 4 duct diameters upstream from any major transitions or branch take-offs. Incorrectly placing the sensing point could result in improper operation of the entire VAV system.

Install the factory-supplied duct static pressure probe with the tip facing into the airflow. See Fig. 16.

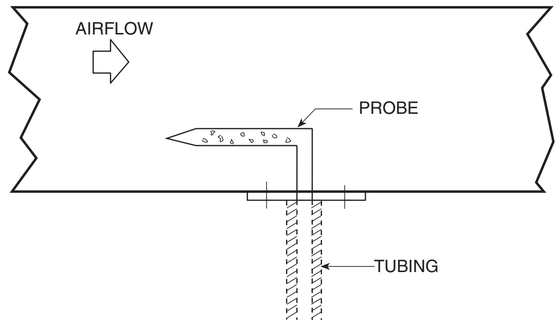



**Fig. 16 — Duct Static Pressure Probe (P/N 39EK20462)**

Use $^{1}/_{4}$-in. OD approved polyethylene tubing for up to 50 ft ($^{3}/_{8}$-in. OD for 50 to 100 ft) to connect the probe to the bulkhead fitting mounted above the unit display panel (Fig. 17). Carefully route the tubing from the probe to this bulkhead fitting.

The static pressure control should be adjusted so that, at full airflow, all of the remote VAV terminal boxes receive the minimum static pressure required plus any downstream resistance. Control the system to the lowest static pressure set point that will satisfy airflow requirements. Lower static pressure set points reduce total required brake horsepower and reduce generated sound levels.

DUCT HIGH-STATIC (DHS) LIMIT SWITCH (VAV Only) — The duct high static limit switch is a mechanical safety that prevents duct overpressurization. The switch is located on the side of the VAV low voltage control panel (Fig. 18) and is factory set at 3 in. wg. To make an adjustment using an accurate differential pressure gage, connect low side and high side to gage and pressure source. Place a voltmeter across common and normally open contacts. Rotate the adjustment knob (Fig. 19) clockwise to increase pressure setting and counterclockwise to decrease pressure setting. When the bottom of the adjustment knob is approximately $^{1}/_{8}$-in. from the switch body, the switch will trip at approximately 3 in. wg.

IMPORTANT: Use tubing that complies with local codes. Improper location or installation of the supply duct pressure tubing will result in unsatisfactory unit operation and poor performance.

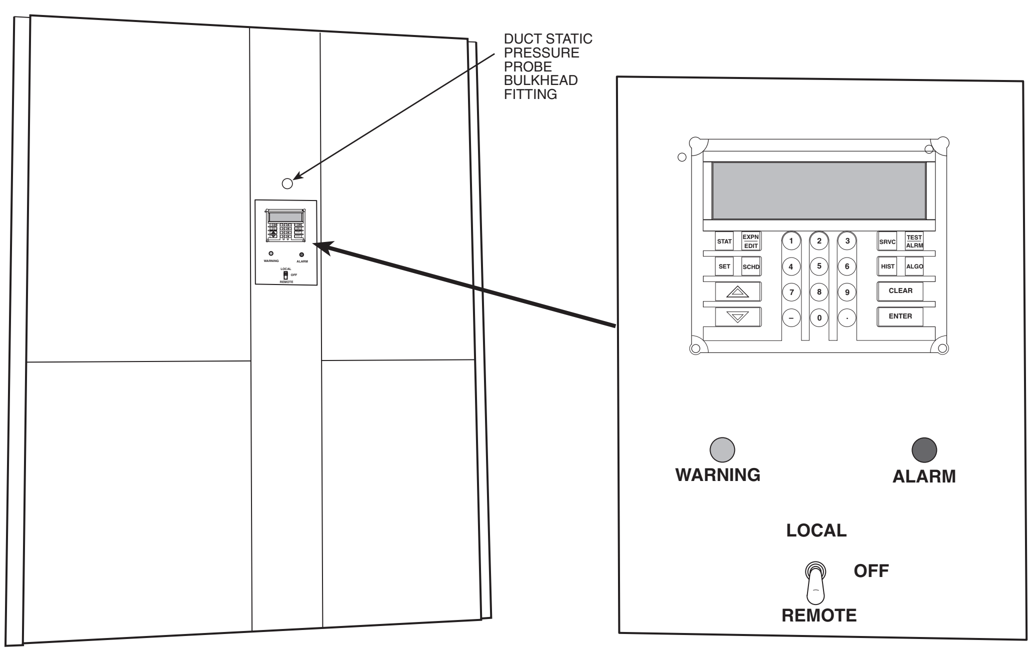



**Fig. 17 — Display Panel Location on Unit Front Panel**

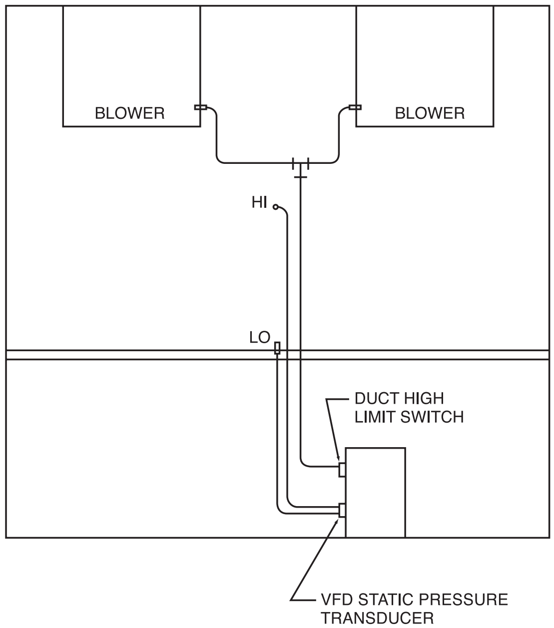



**Fig. 18 — DHS Pressure Limit Location**

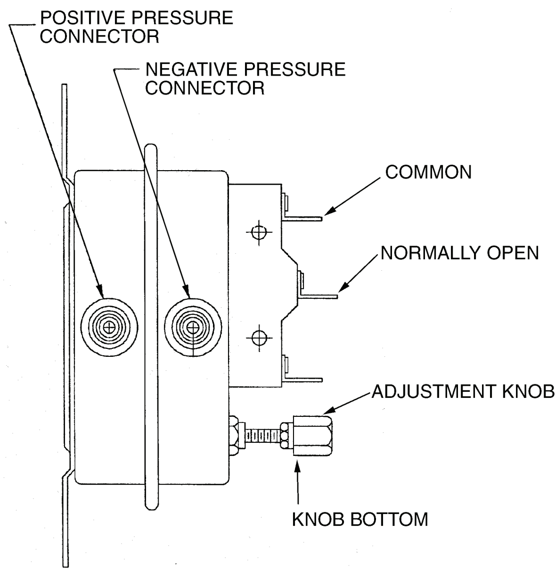



**Fig. 19 — DHS Limit Switch (P/N 190060)**

## Step 4 — Make Piping Connections

CONDENSER WATER PIPING (Water-Cooled Only) — Always follow national and local codes when installing water piping to ensure a safe and proper installation. Connections to the unit should incorporate vibration eliminators to reduce noise and vibration to the building, and shutoff valves to facilitate servicing.

Prior to connecting the unit(s) to the condenser water system, the system should be flushed to remove foreign material that could cause condenser fouling. Install a screen strainer with a minimum of 20 mesh ahead of the condenser inlet to prevent condenser fouling and internal condenser tube damage from foreign material.

Supply and return water piping must be at least as large as the unit connections, and larger for long runs. Refer to the System Design Manual, Part 3, and standard piping practice, when sizing, planning, and routing water piping. See dimension drawings (Fig. 2-14) for water connection sizes and locations.

Units are furnished standard with a copper heat exchanger. A cupronickel heat exchanger is also available as a factory-installed option. Copper is adequate for closed loop systems where good quality water is available. In conditions where scale formation or water treatment is questionable, the optional cupronickel heat exchanger should be used. Where the water is especially corrosive or could lead to excessive fouling, intermediate plate frame heat exchangers are recommended.

**⚠ CAUTION**

Galvanized pipe or fittings are not recommended with 50BV units due to the possibility of galvanic corrosion caused by dissimilar metals. When selecting piping materials, use only approved piping materials that meet applicable codes and that will handle the temperatures and pressures that may be experienced in the application. Piping systems will sweat if low temperature fluid is used in the system. For these applications, supply and return water piping should be insulated to protect from condensation damage. The minimum recommended entering water temperature to the unit is 50 F.

The unit is capable of operating with entering water temperatures as low as 50 F, without the need for head pressure control. If the entering water temperature is expected to be lower, or more stable unit operation is desired, a field-supplied water-regulating valve may be used.

This unit has multiple independent refrigerant circuits with separate condensers. The individual condensers are manifolded together on the waterside to provide easy, single-point water connections. In order to achieve proper head pressure control when a water-regulating valve is used, a temperature-actuated valve is recommended. This allows any of the independent refrigerant circuits to operate while still modulating condenser water flow in response to loop water temperature.

A glycol solution should be used if ambient temperatures are expected to fall below freezing or if the loop water temperature is below 50 F while operating in the reverse cycle heating mode (heat pump units only). Refer to Table 4, which lists freezing points of glycol at different concentrations. A minimum concentration of 20% is recommended. Water pressure drop will increase and unit performance will decrease with increasing glycol concentrations.

Units with factory-installed waterside economizers have cooling water passing through the economizer and condenser in series while operating in the economizer mode. During normal operation, water bypasses the economizer coil.

**Table 4 — Glycol Freezing Points**

| % GLYCOL | FREEZE POINT (° F) | |
|---|---|---|
| | Ethylene Glycol | Proplylene Glycol |
| **20** | 18 | 19 |
| **30** | 7 | 9 |
| **40** | –7 | –5 |
| **50** | –28 | –27 |

All manual flow valves used in the system should be of the ball valve design. Globe or gate valves must not be used due to high pressure drops and poor throttling characteristics.

Do not exceed recommended condenser fluid flow rates shown in Tables 5A and 5B. Serious damage or erosion of the heat exchanger tubes could occur. Piping systems should not exceed 10 fps fluid velocities to ensure quietness and tube wall integrity. Refer to Tables 5A and 5B for condenser water pressure drop versus flow rate. Flow rates outside of the published range should not be used.

Ball valves should be installed in the supply and return lines for unit isolation and water flow balancing.

## Table 5A — Condenser Pressure Drop 50BVC,J,Q Units

| FLOW RATE (gpm) | SIZE 020 | SIZE 024 | SIZE 028 | SIZE 034 |
|---|---|---|---|---|
| | Pressure Drop (ft wg) | | | |
| 35 | 9.1 | — | — | — |
| 40 | 11.2 | 6.0 | — | — |
| 45 | 13.5 | 7.5 | — | — |
| 50 | 15.9 | 9.1 | 9.1 | — |
| 55 | 18.4 | 10.9 | 10.9 | — |
| 60 | 21.1 | 12.8 | 12.8 | 10.8 |
| 65 | 23.9 | 14.8 | 14.9 | 12.7 |
| 70 | 27.4 | 17.0 | 17.2 | 14.7 |
| 75 | — | 19.3 | 19.6 | 16.9 |
| 80 | — | 21.7 | 22.2 | 19.2 |
| 85 | — | — | 24.9 | 21.7 |
| 90 | — | — | 27.8 | 24.3 |
| 95 | — | — | 30.8 | 27.1 |
| 100 | — | — | 34.0 | 30.0 |
| 105 | — | — | — | 33.1 |
| 110 | — | — | — | 36.3 |
| 115 | — | — | — | 39.7 |
| 120 | — | — | — | 43.2 |

LEGEND

**GPM** — Flow Rate
**PD** — Pressure Drop (ft wg)

## Table 5B — Condenser Pressure Drop 50BVT,V,W Units

| FLOW RATE (gpm) | SIZE 034 | SIZE 044 | SIZE 054 | SIZE 064 |
|---|---|---|---|---|
| | Pressure Drop (ft wg) | | | |
| 60 | 8.7 | — | — | — |
| 70 | 11.9 | — | — | — |
| 80 | 15.5 | 6.3 | — | — |
| 90 | 19.6 | 8.0 | — | — |
| 100 | 24.2 | 9.9 | 6.0 | — |
| 110 | 29.3 | 12.0 | 7.3 | — |
| 120 | 34.9 | 14.3 | 8.7 | 8.7 |
| 130 | — | 16.7 | 10.2 | 10.2 |
| 140 | — | 19.4 | 11.8 | 11.8 |
| 150 | — | 22.3 | 13.6 | 13.6 |
| 160 | — | 25.3 | 15.5 | 15.5 |
| 170 | — | — | 17.4 | 17.4 |
| 180 | — | — | 19.6 | 19.6 |
| 190 | — | — | 21.8 | 21.8 |
| 200 | — | — | 24.2 | 24.2 |
| 210 | — | — | — | 26.6 |
| 220 | — | — | — | 29.2 |
| 230 | — | — | — | 31.9 |
| 240 | — | — | — | 34.8 |

LEGEND

**GPM** — Flow Rate
**PD** — Pressure Drop (ft wg)

Pressure and temperature ports are recommended in both the supply and return lines for system flow balancing. These openings should be 5 to 10 pipe diameters from the unit water connections. For thorough mixing and temperature stabilization, wells in the water piping should extend at least $^1/_2$ pipe diameter into the pipe. Measuring the condenser waterside pressure drop and referring to Tables 5A and 5B can help to properly set the water flow rate.

Improper fluid flow due to valving, piping, or improper pump operation constitutes abuse that may result in voiding of unit warranty. The manufacturer will not be responsible for damages or failures resulting from improper piping design or piping material selection.

EVAPORATOR CONDENSATE DRAIN — The condensate drain connection is $1^1/_4$-in. FPT and is located on the same side of the unit as the condenser water connections. See dimension drawings (Fig. 2-14) for exact location.

Drain lines should be pitched away from the unit with a minimum slope of $^1/_8$-in. per foot and conform to all local and national codes.

A trap must be installed in the condensate line to ensure free condensate flow (units are not internally trapped). A vertical air vent is sometimes required to avoid air pockets.

Install a condensate-trapping drain line at the units drain connection. See Fig. 20 for correct drain layout.

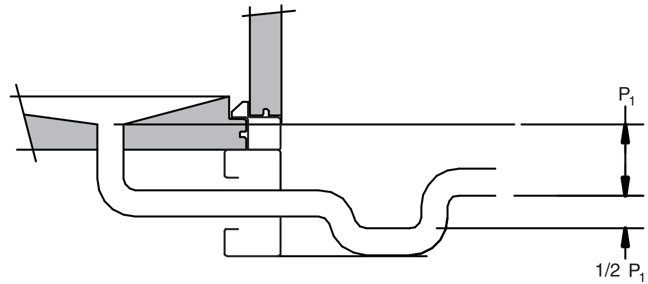



**Fig. 20 — Condensate Drain Layout**

When calculating trap depth, remember that it is not the total static pressure but the upstream or downstream static resistance that is trapped against. For instance, when calculating the trap depth for a cooling coil condensate pan, trap against the coil pressure drop in that coil section and any other pressure drops upstream of it.

If calculating the trap depth for the cooling coil, use the total static pressure drop (coil plus any other components upstream of it) plus 1 in. ($P_1$ = negative static pressure + 1 in.), as shown in Fig. 21.

Traps must store enough condensate to prevent losing the drain seal at start-up. The "Minimum $^1/_2$ $P_1$" dimension ensures that enough condensate is stored.

Drain pans should be cleaned periodically to avoid the build-up of dirt and bacterial growth.

HOT WATER HEATING COIL (Optional) — A factory-installed one or 2-row hot water heating coil is available as an option. The coil is supplied with hot water from a boiler through separate piping from the condenser water loop. All controls for heating operation are field-supplied.

Piping should be in accordance with accepted industry standards and all components rated for the system pressure expected. Pipe the coils so that they will drain, and provide a drain and vent.

Always connect the supply to the top of the coil, and the return to the bottom. Refer to Fig. 2-14 for hot water supply and return piping locations.

Water coils should not be subjected to entering air temperatures below 38 F to prevent coil freeze-up. If air temperatures across the coil are going to be below this value, use a glycol or brine solution. Use a solution with the lowest concentration that will match the coldest air expected. Excess concentrations will greatly reduce coil capacity.

The return air duct system should be carefully designed to get adequate mixing of the return air and outdoor air streams to prevent cold spots on the coil that could freeze.

A 2 or 3-way, field-supplied modulating control valve, or a simple 2-position on-off valve may be used to control water flow. Select the valve based on the control valve manufacturer's recommendations for size and temperature rating. Select the control valve CV based on pressure drop and flow rate through the coil. This information is available from the *VPACBuilder* software program or Tables 6A and 6B.

### Table 6A — Hot Water Pressure Drop 50BVC,E,J,K,Q Units

| FLOW RATE (gpm) | SIZE 020 | SIZE 024 | SIZE 028 | SIZE 034 |
|---|---|---|---|---|
| | Pressure Drop (ft wg) | | | |
| 10 | 0.7 | 0.7 | 0.7 | — |
| 15 | 1.5 | 1.5 | 1.5 | — |
| 20 | 2.6 | 2.6 | 2.6 | — |
| 25 | 4.0 | 4.0 | 4.0 | — |
| 30 | 5.8 | 5.8 | 5.8 | 0.1 |
| 35 | 7.8 | 7.8 | 7.8 | 0.1 |
| 40 | 10.2 | 10.2 | 10.2 | 0.1 |
| 45 | 12.9 | 12.9 | 12.9 | 0.2 |
| 50 | 15.8 | 15.8 | 15.8 | 0.2 |
| 55 | — | — | — | 0.3 |
| 60 | — | — | — | 0.3 |
| 65 | — | — | — | 0.4 |

LEGEND

**GPM** — Flow Rate
**PD** — Pressure Drop (ft wg)

### Table 6B — Hot Water Pressure Drop 50BVT,U,V,W,X Units

| FLOW RATE (gpm) | SIZE 034 | SIZE 044 | SIZE 054 | SIZE 064 |
|---|---|---|---|---|
| | Pressure Drop (ft wg) | | | |
| 45 | 2.4 | — | — | — |
| 50 | 3.0 | — | — | — |
| 55 | 3.6 | — | — | — |
| 60 | 4.3 | — | — | — |
| 65 | 5.0 | — | — | — |
| 70 | 5.7 | — | — | — |
| 75 | 6.6 | — | — | — |
| 80 | 7.4 | — | — | — |
| 85 | 8.4 | — | — | — |
| 90 | 9.3 | 2.5 | 2.5 | 2.5 |
| 100 | — | 3.1 | 3.1 | 3.1 |
| 110 | — | 3.7 | 3.7 | 3.7 |
| 120 | — | 4.4 | 4.4 | 4.4 |
| 130 | — | 5.1 | 5.1 | 5.1 |
| 140 | — | 5.9 | 5.9 | 5.9 |
| 150 | — | 6.7 | 6.7 | 6.7 |
| 160 | — | 7.6 | 7.6 | 7.6 |
| 170 | — | 8.6 | 8.6 | 8.6 |
| 180 | — | 9.6 | 9.6 | 9.6 |

LEGEND

**GPM** — Flow Rate
**PD** — Pressure Drop (ft wg)

Pipe sizes should be selected based on the head pressure available from the pump. Water velocity should not exceed 8 fps. Design the piping system for approximately 3 ft of loss per 100 equivalent ft of pipe. The piping system should allow for expansion and minimize vibration between the unit and piping system.

WATER ECONOMIZER (Optional) — The optional waterside economizer (pre-cooling coil) is factory-installed and piped internally, in series with the condenser water circuit (Fig. 21). A diverting valve and factory controls are included with the option. Only one set of field connections needs to be made for condenser water and economizer water. In addition, when the unit is shipped with the economizer option, the economizer drain must be connected to a separate trap. Follow the same steps for the economizer drain as described for the evaporator condensate drain. An Aquastat is used to modulate water flow through the economizer. The controller is mounted to the low voltage control box. Electrical connections are factory installed and wired. The remote bulb is shipped internal to the unit and requires field mounting. Care should be taken not to dent the bulb or miscalibration may occur. The Aquastat has a temperature range adjustment (–30 F to 100 F) and is field set. See Fig. 2-14 for connection locations and sizes. See Tables 7A and 7B for economizer waterside pressure drop data.

The waterside economizer can also be ordered without factory-installed piping or controls. This offers additional flexibility for specific applications. In this case, the coil is factory mounted, but all supply and return piping and controls are field supplied.

### Table 7A — Economizer Pressure Drop Curve (ft wg), 50BVC,E,J,K,Q Units

| FLOW RATE (gpm) | SIZE 020 | SIZE 024 | SIZE 028 | SIZE 034 |
|---|---|---|---|---|
| | Pressure Drop (ft wg) | | | |
| 35 | 8.9 | — | — | — |
| 40 | 11.5 | 11.0 | — | — |
| 45 | 14.4 | 13.8 | — | — |
| 50 | 17.6 | 16.9 | 16.9 | — |
| 55 | 21.1 | 20.4 | 20.4 | — |
| 60 | 24.9 | 24.1 | 24.1 | 3.5 |
| 65 | 29.0 | 28.1 | 28.2 | 4.1 |
| 70 | 34.4 | 32.5 | 32.5 | 4.7 |
| 75 | — | 37.1 | 37.2 | 5.4 |
| 80 | — | 42.1 | 42.1 | 6.1 |
| 85 | — | — | 47.4 | 6.9 |
| 90 | — | — | 52.9 | 7.7 |
| 95 | — | — | 58.7 | 8.5 |
| 100 | — | — | 64.9 | 9.4 |
| 105 | — | — | — | 10.3 |
| 110 | — | — | — | 11.3 |
| 115 | — | — | — | 12.3 |
| 120 | — | — | — | 13.4 |

LEGEND

**GPM** — Flow Rate
**PD** — Pressure Drop (ft wg)

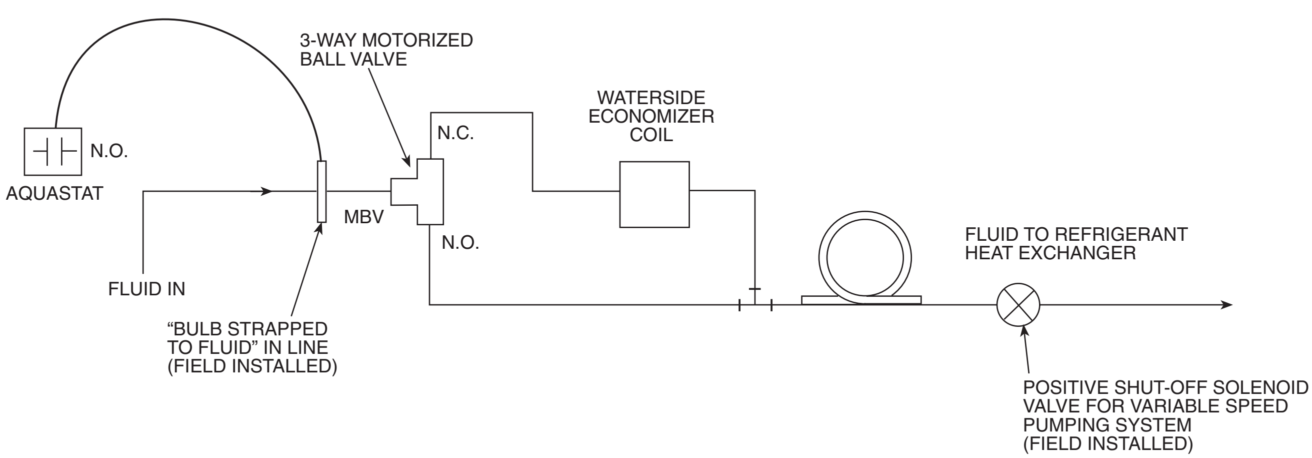



**Fig. 21 — Optional Water Economizer**

## Table 7B — Economizer Pressure Drop Curve (ft wg), 50BVT,U,V,W,X Units

| FLOW RATE (gpm) | SIZE 034 | SIZE 044 | SIZE 054 | SIZE 064 |
|---|---|---|---|---|
| | Pressure Drop (ft wg) | | | |
| **60** | 13.1 | — | — | — |
| **70** | 17.9 | — | — | — |
| **80** | 23.5 | 5.8 | — | — |
| **90** | 29.8 | 7.3 | — | — |
| **100** | 36.9 | 9.1 | 9.0 | — |
| **110** | 44.8 | 11.0 | 11.0 | — |
| **120** | 53.4 | 13.1 | 13.1 | 13.1 |
| **130** | — | 15.4 | 15.4 | 15.4 |
| **140** | — | 17.9 | 17.9 | 17.9 |
| **150** | — | 20.6 | 20.6 | 20.6 |
| **160** | — | 23.5 | 23.5 | 23.5 |
| **170** | — | — | 26.6 | 26.5 |
| **180** | — | — | 29.8 | 29.8 |
| **190** | — | — | 33.3 | 33.2 |
| **200** | — | — | 36.9 | 36.8 |
| **210** | — | — | — | 40.7 |
| **220** | — | — | — | 44.7 |
| **230** | — | — | — | 48.9 |
| **240** | — | — | — | 53.3 |

LEGEND

**GPM** — Flow Rate
**PD** — Pressure Drop (ft wg)

REMOTE REFRIGERANT PIPING (Remote Air-Cooled Only) — Carrier 50BVE,K,U,X units are supplied without condensers. To complete the installation, these units must be field connected to a suitable remote condenser. The 50BV units from 18 to 30 tons contain 2 equally sized independent refrigerant circuits. Units from 40 to 60 tons have 4 separate equal capacity refrigerant circuits. It is important that the condenser circuiting be properly matched to the 50BV unit circuiting. Otherwise, unsatisfactory operation will result. Carrier will not be responsible for improperly matched remote condenser selections. Recommended condenser matches are shown in Table 8.

## Table 8 — Recommended Condenser Matches for 50BVE,K,U,X Units

| 50BV | NO. OF CKTS | CONDENSER(S) | CONDENSER CIRCUITING |
|---|---|---|---|
| **020** | 2 | 09DK020 (1) | 50/50% |
| **024** | 2 | 09DK024 (1) | 50/50% |
| **028** | 2 | 09DK028 (1) | 50/50% |
| **034** | 2 | 09DK034 (1) | 50/50% |
| **044** | 4 | 09DK024 (2) | 50/50% (each) |
| **054** | 4 | 09DK028 (2) | 50/50% (each) |
| **064** | 4 | 09DK034 (2) | 50/50% (each) |

Install the air-cooled condenser or condensers according to the installation instructions provided with the condenser(s). Connection locations and sizes for the hot gas and liquid lines on the 50BV units are shown in Fig. 2-14, 22 and 23. For 50BV units up to 30 tons, there will be 2 hot gas lines and 2 liquid lines to install between the unit and the condenser. Above 30 tons, 4 hot gas lines and 4 liquid lines will be installed between the unit and the 2 condensers. Refer to the System Design Manual, Part 3 for standard refrigerant piping techniques. Also see the air-cooled condenser installation instructions for additional guidance.

Remote air-cooled 50BV units (only) are shipped with a dry nitrogen holding charge. After refrigerant connections are made, release nitrogen, evacuate, leak test, and charge the system as described in Charging the System in the Maintenance section of this manual.

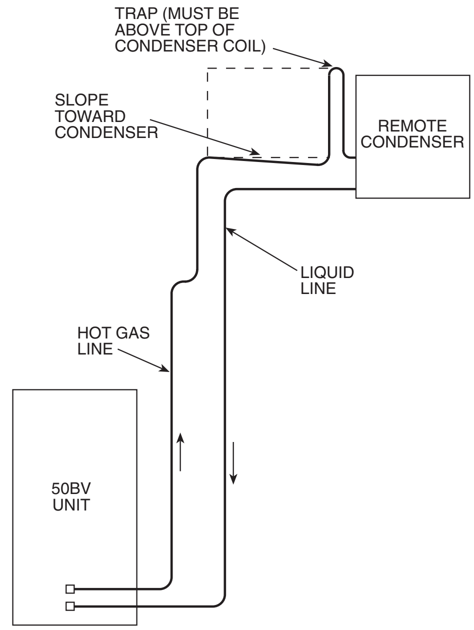



**Fig. 22 — System with Condenser Above Evaporator**

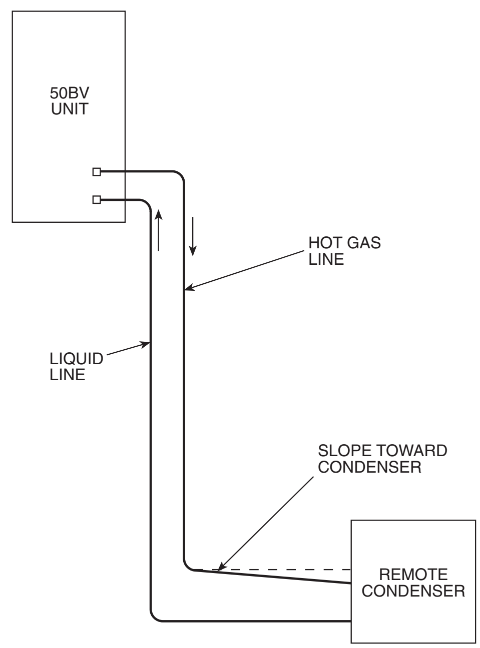



**Fig. 23 — System with Evaporator Above Condenser**

## Step 5 — Complete Electrical Connections —

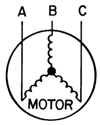
Verify that electrical requirements listed on the unit nameplate match available power supply. The unit voltage must be within the range shown in Tables 9A and 9B and phases must be balanced within 2%. Contact the local power company for line voltage corrections. Never operate a motor where a phase imbalance in supply voltage is greater than 2%.

For an unbalanced 3-phase supply voltage, use the following formula to determine the percent of voltage imbalance:

Percent Voltage Imbalance

$$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 460-3-60.




AB = 452 V
BC = 464 V
AC = 455 V

$$\text{Average Voltage} = \frac{452 + 464 + 455}{3}$$

$$= \frac{1371}{3}$$

$$= 457$$

Determine maximum deviation from average voltage:

(AB) 457 – 452 = 5 V
(BC) 464 – 457 = 7 V
(AC) 457 – 455 = 2 V

Maximum deviation is 7 V.

Determine percent of voltage imbalance:

$$\%\ \text{Voltage Imbalance} = 100 \times \frac{7}{457}$$

$$= 1.53\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

> IMPORTANT: If supply voltage phase imbalance is more than 2%, contact the local electric utility company immediately.

POWER WIRING — Properly sized fuses or HACR (Heating, Air Conditioning and Refrigeration) circuit breakers must be installed for branch circuit protection, according to the national and applicable local codes. See unit nameplate and Tables 9A and 9B for maximum overcurrent protection size.

These units are provided with single point, main power supply terminal blocks. Refer to Fig. 2-14 for conduit connection locations. Connect the power leads as indicated on the unit wiring diagrams (found in the Troubleshooting section) and be certain to connect the ground lead to the ground lug in the unit high voltage electrical box. Refer to Tables 9A and 9B for unit electrical data.

**Table 9A — Electrical Data — 50BVC,E,J,K,Q**

| UNIT SIZE 50BVC,E,J,K,Q | NOMINAL VOLTAGE (3 Ph, 60 Hz) | VOLTAGE RANGE | | COMPRESSOR | | | | INDOOR FAN MOTOR | | | POWER SUPPLY | | DISCONNECT SIZE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | No. 1 | | No. 2 | | | | | | | |
| | | Min | Max | RLA | LRA | RLA | LRA | Qty | HP (ea) | FLA (ea) | MCA | MOCP | FLA |
| 020 | 208/230 | 187 | 253 | 32.9 | 195 | 32.9 | 195 | 2 | 1.5 | 5.0 | 84.0 | 110 | 75.8 |
| | | | | | | | | | 2 | 6.4 | 86.8 | 110 | 78.6 |
| | | | | | | | | | 3 | 9.0 | 92.0 | 110 | 83.8 |
| | | | | | | | | | 5 | 12.2 | 98.4 | 110 | 90.2 |
| | 460 | 414 | 506 | 16.5 | 95 | 16.5 | 95 | 2 | 1.5 | 2.5 | 42.1 | 50 | 38.0 |
| | | | | | | | | | 2 | 3.2 | 43.5 | 50 | 39.4 |
| | | | | | | | | | 3 | 4.5 | 46.1 | 50 | 42.0 |
| | | | | | | | | | 5 | 6.1 | 49.3 | 50 | 45.2 |
| | 575 | 518 | 633 | 13.6 | 80 | 13.6 | 80 | 2 | 1.5 | 2.0 | 34.6 | 45 | 31.2 |
| | | | | | | | | | 2 | 2.0 | 34.6 | 45 | 31.2 |
| | | | | | | | | | 3 | 3.6 | 37.8 | 45 | 34.4 |
| | | | | | | | | | 5 | 5.4 | 41.4 | 45 | 38.0 |
| 024 | 208/230 | 187 | 253 | 33.6 | 225 | 33.6 | 225 | 2 | 2 | 6.4 | 88.4 | 120 | 80.0 |
| | | | | | | | | | 3 | 9.0 | 93.6 | 120 | 85.2 |
| | | | | | | | | | 5 | 12.2 | 100.0 | 120 | 91.6 |
| | 460 | 414 | 506 | 18.6 | 114 | 18.6 | 114 | 2 | 2 | 3.2 | 48.3 | 60 | 43.6 |
| | | | | | | | | | 3 | 4.5 | 50.85 | 60 | 46.2 |
| | | | | | | | | | 5 | 6.1 | 54.05 | 60 | 49.4 |
| | 575 | 518 | 633 | 13.6 | 80 | 13.6 | 80 | 2 | 2 | 2.0 | 34.6 | 45 | 31.2 |
| | | | | | | | | | 3 | 3.6 | 37.8 | 45 | 34.4 |
| | | | | | | | | | 5 | 5.4 | 41.4 | 45 | 38.0 |
| 028 | 208/230 | 187 | 253 | 53.6 | 245 | 53.6 | 245 | 2 | 3 | 9.0 | 138.6 | 190 | 125.2 |
| | | | | | | | | | 5 | 12.2 | 145.0 | 190 | 131.6 |
| | 460 | 414 | 506 | 20.7 | 125 | 20.7 | 125 | 2 | 3 | 4.5 | 55.6 | 70 | 50.4 |
| | | | | | | | | | 5 | 6.1 | 58.8 | 70 | 53.6 |
| | 575 | 518 | 633 | 16.4 | 100 | 16.4 | 100 | 2 | 3 | 3.6 | 44.1 | 60 | 40.0 |
| | | | | | | | | | 5 | 5.4 | 47.7 | 60 | 43.6 |
| 034 | 208/230 | 187 | 253 | 59.1 | 425 | 59.1 | 425 | 2 | 5 | 12.2 | 157.4 | 200 | 142.6 |
| | 460 | 414 | 506 | 26.4 | 187 | 26.4 | 187 | 2 | 5 | 6.1 | 71.6 | 90 | 65.0 |
| | 575 | 518 | 633 | 20.5 | 148 | 20.5 | 148 | 2 | 5 | 5.4 | 56.9 | 70 | 51.8 |

LEGEND

**FLA** — Full Load Amps
**HP** — Horsepower
**LRA** — Locked Rotor Amps
**MCA** — Minimum Circuit Amps
**MOCP** — Maximum Overcurrent Protection
**RLA** — Rated Load Amps

## Table 9B — Electrical Data — 50BVT,U,V,W,X

| UNIT SIZE 50BVT,U,V,W,X | NOMINAL VOLTAGE (3 Ph, 60 Hz) | VOLTAGE RANGE | | COMPRESSOR | | | | INDOOR FAN MOTOR | | | POWER SUPPLY | | DISCONNECT SIZE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | No. 1 / No. 2 | | No. 3 / No. 4 | | | | | | | |
| | | Min | Max | RLA | LRA | RLA | LRA | Qty | HP (ea) | FLA (ea) | MCA | MOCP | FLA |
| 034 | 208/230 | 187 | 253 | 62.2 | 376 | — | — | 1 | 7.5 | 19.4 | 159.4 | 200 | 143.8 |
| | | | | | | | | | 10 | 25.8 | 165.8 | 225 | 150.2 |
| | | | | | | | | | 15 | 38.6 | 178.6 | 225 | 163.0 |
| | | | | | | | | | 20 | 49.6 | 189.6 | 250 | 174.0 |
| | 460 | 414 | 506 | 27.6 | 178 | — | — | 1 | 7.5 | 9.7 | 71.8 | 90 | 64.9 |
| | | | | | | | | | 10 | 12.9 | 75.0 | 100 | 68.1 |
| | | | | | | | | | 15 | 19.3 | 81.4 | 100 | 74.5 |
| | | | | | | | | | 20 | 24.8 | 86.9 | 110 | 80.0 |
| | 575 | 518 | 633 | 20.5 | 148 | — | — | 1 | 7.5 | 7.8 | 53.9 | 70 | 48.8 |
| | | | | | | | | | 10 | 10.3 | 56.4 | 70 | 51.3 |
| | | | | | | | | | 15 | 15.4 | 61.5 | 80 | 56.4 |
| | | | | | | | | | 20 | 19.8 | 65.9 | 80 | 60.8 |
| 044 | 208/230 | 187 | 253 | 42.0 | 239 | 42.0 | 239 | 2 | 7.5 | 19.4 | 217.3 | 250 | 206.8 |
| | | | | | | | | | 10 | 25.8 | 230.1 | 250 | 219.6 |
| | | | | | | | | | 15 | 38.6 | 255.7 | 250 | 245.2 |
| | 460 | 414 | 506 | 19.2 | 125 | 19.2 | 125 | 2 | 7.5 | 9.7 | 101.0 | 110 | 96.2 |
| | | | | | | | | | 10 | 12.9 | 107.4 | 125 | 102.6 |
| | | | | | | | | | 15 | 19.3 | 120.2 | 125 | 115.4 |
| | 575 | 518 | 633 | 12.4 | 80 | 12.4 | 80 | 2 | 7.5 | 7.8 | 68.3 | 80 | 65.2 |
| | | | | | | | | | 10 | 10.3 | 73.3 | 80 | 70.2 |
| | | | | | | | | | 15 | 15.4 | 83.5 | 90 | 80.4 |
| 054 | 208/230 | 187 | 253 | 47.1 | 318 | 47.1 | 318 | 2 | 7.5 | 19.4 | 239.0 | 250 | 227.2 |
| | | | | | | | | | 10 | 25.8 | 251.8 | 250 | 240.0 |
| | | | | | | | | | 15 | 38.6 | 277.4 | 300 | 265.6 |
| | | | | | | | | | 20 | 49.6 | 299.4 | 300 | 287.6 |
| | 460 | 414 | 506 | 22.6 | 158 | 22.6 | 158 | 2 | 7.5 | 9.7 | 115.5 | 125 | 109.8 |
| | | | | | | | | | 10 | 12.9 | 121.9 | 125 | 116.2 |
| | | | | | | | | | 15 | 19.3 | 134.7 | 150 | 129.0 |
| | | | | | | | | | 20 | 24.8 | 145.7 | 150 | 140.0 |
| | 575 | 518 | 633 | 17.3 | 125 | 17.3 | 125 | 2 | 7.5 | 7.8 | 89.1 | 100 | 84.8 |
| | | | | | | | | | 10 | 10.3 | 94.1 | 110 | 89.8 |
| | | | | | | | | | 15 | 15.4 | 104.3 | 110 | 100.0 |
| | | | | | | | | | 20 | 19.8 | 113.1 | 125 | 108.8 |
| 064 | 208/230 | 187 | 253 | 62.2 | 376 | 62.2 | 376 | 2 | 7.5 | 19.4 | 303.2 | 350 | 287.6 |
| | | | | | | | | | 10 | 25.8 | 316.0 | 350 | 300.4 |
| | | | | | | | | | 15 | 38.6 | 341.6 | 400 | 326.0 |
| | | | | | | | | | 20 | 49.6 | 363.6 | 400 | 348.0 |
| | 460 | 414 | 506 | 27.6 | 178 | 27.6 | 178 | 2 | 7.5 | 9.7 | 136.7 | 150 | 129.8 |
| | | | | | | | | | 10 | 12.9 | 143.1 | 150 | 136.2 |
| | | | | | | | | | 15 | 19.3 | 155.9 | 150 | 149.0 |
| | | | | | | | | | 20 | 24.8 | 166.9 | 175 | 160.0 |
| | 575 | 518 | 633 | 20.5 | 148 | 20.5 | 148 | 2 | 7.5 | 7.8 | 102.7 | 110 | 97.6 |
| | | | | | | | | | 10 | 10.3 | 107.7 | 125 | 102.6 |
| | | | | | | | | | 15 | 15.4 | 117.9 | 125 | 112.8 |
| | | | | | | | | | 20 | 19.8 | 126.7 | 125 | 121.6 |

LEGEND

**FLA** — Full Load Amps
**HP** — Horsepower
**LRA** — Locked Rotor Amps
**MCA** — Minimum Circuit Amps
**MOCP** — Maximum Overcurrent Protection
**RLA** — Rated Load Amps

Modular Units — For units with multiple main air-conditioning sections, connect the high voltage compressor power wiring to the line side of the high voltage terminal block in the second section's high voltage electrical box. This wiring is located in the upper portion of the compressor compartment.

Connect the low voltage wiring, located in the compressor compartment, between the two air conditioning sections using the quick connects provided.

For the supply fan motor, connect the 3-phase high voltage wiring, coiled behind the high voltage panel, to the line side of the supply fan motor terminal block located in the fan compartment. For VAV units, connect the 3-phase high voltage wiring to the line side of VFD.

For units with multiple fans, connect the control power wiring with the quick connects provided at the fan compartment junction.

CONTROL WIRING (CV Only) — A standard commercial thermostat controls constant volume units. These units turn compressors on or off in response to zone temperature. The 50BV units provide 2 stages of cooling.

50BVC,E,Q020-034 and 50BVT,U,V034 Only — These models have 2 independent refrigerant circuits, each capable of being staged independently. Thermostat wiring is connected to the 6-position low voltage terminal block located in the unit electrical box. The 50BV units have a 24-VAC control transformer, which provides power to the control circuit and to the thermostat. The thermostat connections and their functions are as follows:

| | |
|---|---|
| C | Transformer 24-v ac Common |
| O | Reversing Valve (heat pumps only) |
| Y1 | 1st Stage Compressor Contactor |
| Y2 | 2nd Stage Compressor Contactor |
| R | Transformer 24-v ac Hot |
| G | Indoor Fan Contactor |

Select an appropriate commercial thermostat that has 2 stages of cooling control. If the unit is a heat pump, make sure the thermostat is capable of heat pump control. Any of the Debonair® series commercial thermostats will meet the requirements, and are available in a variety of attractive styles, in programmable and non-programmable versions.

Install the thermostat in the space where the temperature is being controlled, according to the instructions provided with the thermostat.

**⚠ WARNING**

Before wiring the thermostat to the unit, make sure that main power to the unit has been disconnected. Failure to heed this warning could result in personal injury.

To wire the thermostat:

1. Connect the 'C' terminal from the 50BV unit to the 'C' terminal on the thermostat.
2. Wire the 'Y1' and 'Y2' terminals from the 50BV unit to the 'Y1' and 'Y2' terminals, respectively, at the thermostat.
3. Make a connection between the 'G' terminal on the unit and the 'G' terminal on the thermostat.
4. Attach a wire from the 'R' terminal at the unit to the 'R' terminal at the thermostat.
5. 50BVQ and 50BVV ONLY: If the unit is a heat pump, connect a final wire from terminal 'O' on the heat pump unit to the 'W1/O/B' terminal at the thermostat. Configure the thermostat for heat pump operation using the installation instructions provided with the thermostat. Set the reversing valve polarity of the thermostat to 'O'.

See Fig. 24 for typical thermostat wiring.

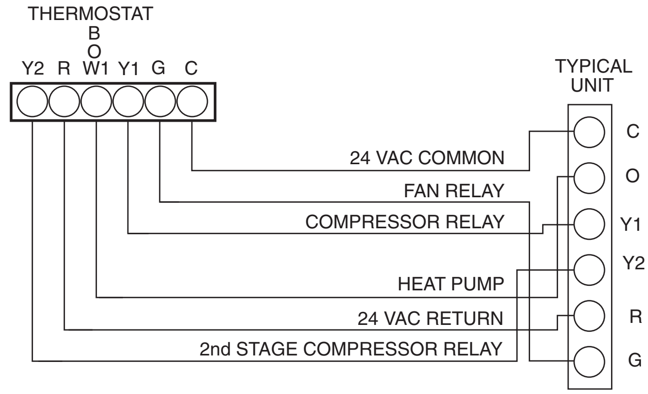



**Fig. 24 — Typical Wiring 18 to 30 Ton Units (Two-Stage Cooling Units)**

50BVT,U,V044-064 Only — Units larger than 30 tons have 4 independent refrigerant circuits.

These units can be controlled using a standard commercial, 2-stage thermostat. In this case, the first stage of cooling will turn on compressors 1 and 2, and the second stage will turn on compressors 3 and 4. It is also possible to have 4 stages of cooling, using a suitable field-supplied control method.

For 2-stage thermostat wiring, refer to Fig. 25. Jumpers must be installed between the G and O terminals in Modules A and B. A field-supplied, 24-v pilot relay should be used to energize Y2 on Module B whenever Y1 is energized on Module A. Similarly, a field-supplied 24-v pilot relay should be installed to energize Y4 on Module B whenever Y3 on Module A is energized (Y2 stage of thermostat calls for cooling).

Finally, verify that transformer phasing is consistent between Modules A and B.

REMOTE CONDENSER FAN CONTACTOR WIRING — For units up to 30 tons, one remote condenser is required. Install a field-supplied 24-v pilot relay (Aux relay) between Y1 and C. This will energize the FC contactor on the remote condenser whenever there is a call for cooling.

For 40 to 60 ton units, 2 remote condensers are required. Be sure to make piping connections so that compressors 1 and 2 are connected to condenser 1, and compressors 3 and 4 are connected to condenser 2. Use an additional set of NO (normally open) contacts on PR1 to energize FC1 on condenser 1, and a set of NO contacts on PR2 to energize FC1 on condenser 2.

CONTROL WIRING (VAV Only) — The VAV units are designed to operate either with a building management system or stand alone (local control).

Carrier Comfort Network® Control Wiring — The CC6400 Control Module connects to the Carrier Comfort Network (CCN) bus in a daisy chain arrangement. Negative pins on each component must be connected to respective negative pins and likewise positive pins on each component must be connected to respective positive pins. The controller signal pins must be wired to the signal ground pins. Wiring connections for CCN must be made at the 3-pin plug.

At any baud rate (9600, 19200, 38400 baud), the number of controllers is limited to 239 devices maximum. Bus length may not exceed 4000 ft, with no more than 60 total devices on any 1000-ft section. Optically isolated RS-485 repeaters are required every 1000 ft.

NOTE: Carrier device default is 9600 baud.

The CCN communication bus wiring is field supplied and field installed. It consists of shielded 3-conductor cable with drain (ground) wire. The cable selected must be identical to the CCN communication bus wire used for the entire network. See Table 10 for cable recommendations.

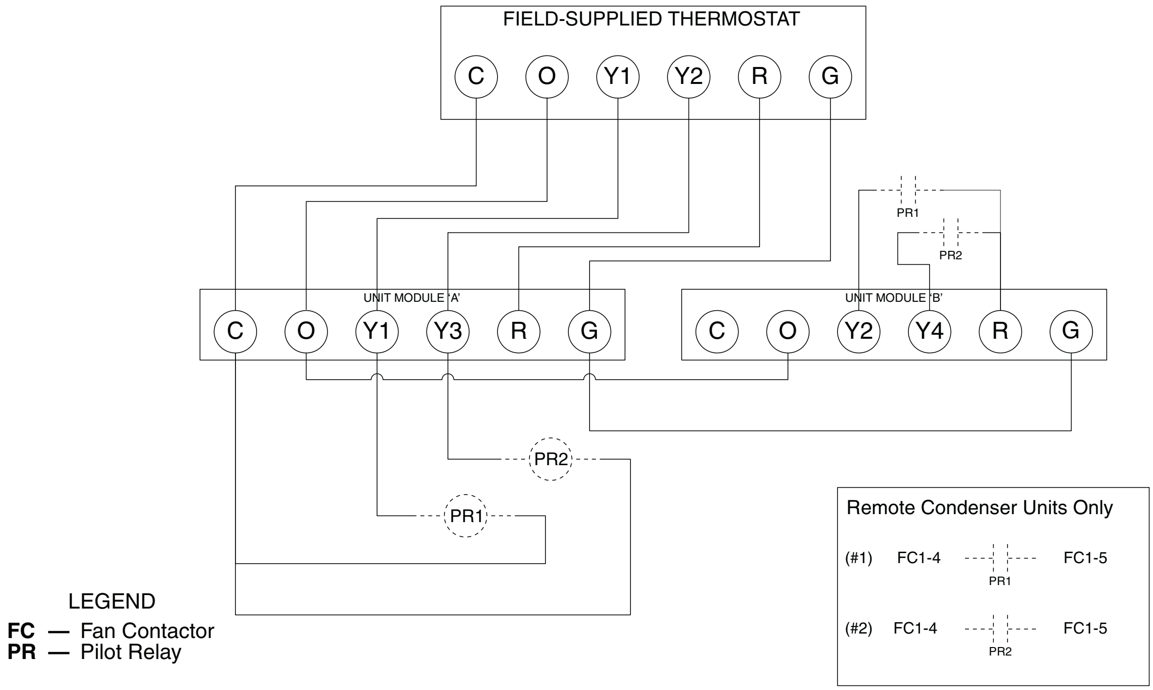



**Fig. 25 — Typical Wiring 40 to 60 Ton Units (Two-Stage Cooling)**

**Table 10 — Recommended Cables**

| MANUFACTURER | PART NUMBER |
|---|---|
| Alpha | 2413 or 5463 |
| American | A22503 |
| Belden | 8772 |
| Columbia | 02525 |

NOTE: Conductors and drain wire must be at least 20 AWG (American Wire Gage), stranded, and tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon®*, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –20 C to 60 C is required.

The communication bus shields must be tied together at each system element. If the communication bus is entirely within one building, the resulting continuous shield must be connected to ground at only one single point. If the communication bus cable exits from one building and enters another building, the shields must be connected to the grounds at a lightning suppressor in each building (one point only).

Wiring Control Devices — Standard controls require no field wiring.

Standard controls for VAV applications include: duct static pressure (DSP), duct high static limit switch (DHS), compressor status (CSMUX), supply fan start/stop (SF), and supply fan speed (SPEED).

Field-installed devices and the factory-supplied supply air temperature sensor (required) will be wired to the field terminal block (TB2) provided. Refer to Fig. 26 and the following descriptions. This terminal is located in the control panel as shown in Fig. 27 and 28.

*Teflon is a registered trademark of E.I. du Pont de Nemours and Company.

SUPPLY AIR TEMPERATURE SENSOR (SAT) — The supply air temperature sensor (Fig. 29) is used to measure the temperature of the air leaving the unit. The sensor should be located in the supply air duct, about 1 ft from the unit discharge connection (Fig. 30). On units with 2 fans, locate the sensor approximately 5 duct diameters downstream from “pair of pants” duct connection, allowing for adequate mixing of supply air.

Mount the sensor as follows:

1. Remove the cover of the sensor junction box.
2. Drill a $^{7}/_{16}$-in. hole at the selected location.
3. Install the sensor through the hole and secure using 2 no. 8 screws (provided). Do not overtighten.
4. Connect the sensor to the control box. Use an 18 or 20 AWG, 2 conductor, twisted pair cable. This cable is suitable for distances of up to 500 feet.

Connect the field wires to the supply air sensor using wire nuts or closed end style crimp connectors. Do not cut the sensor leads. Use the full length of lead supplied on the sensor.

In the control box, remove the jacket from the cable. Route the sensor wires over to the right hand side of the field terminal block (TB2). Strip the insulation back about $^{1}/_{4}$-in. from each conductor. Connect the two wires to terminals 101 and 102 (SAT) on the terminal board. Polarity is not a consideration. See Table 11 for resistance vs. temperature values.

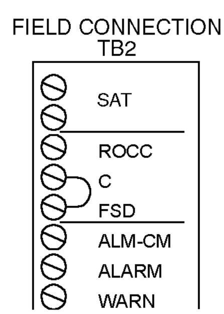



**Fig. 26 — Field Terminal Block**

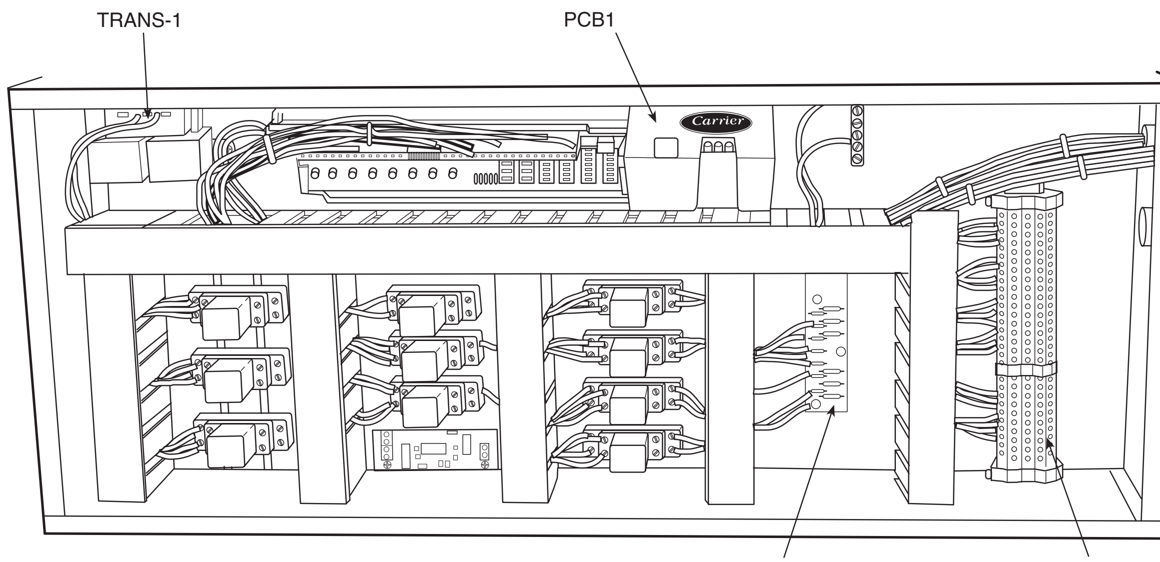



**Fig. 27 — Modular Unit VAV Control Panel**

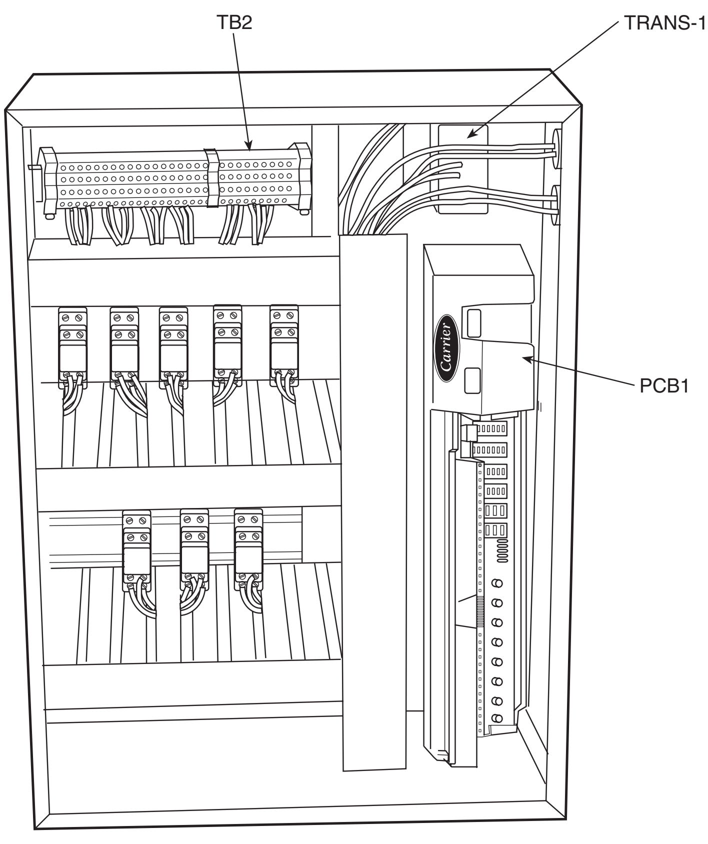



**Fig. 28 — Single-Piece Unit VAV Control Panel**

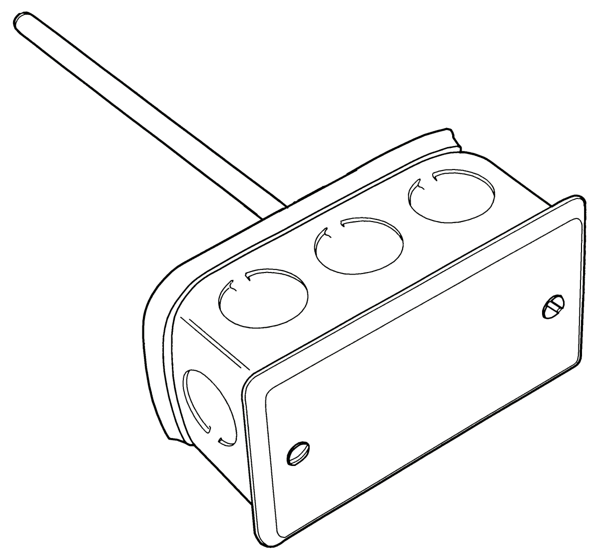


**Fig. 29 — Supply/Return Air Temperature Sensor (P/N HH79NZ043)**

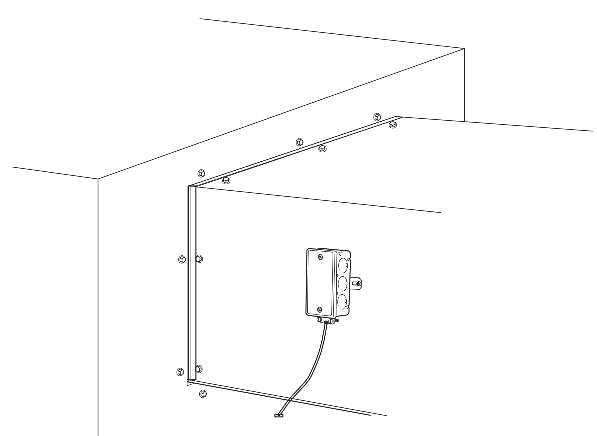


**Fig. 30 — Supply-Air Temperature Sensor Installation (Unit Discharge Location)**

**Table 11 — Thermistor Resistance vs Temperature Values for Supply-Air Temperature Sensor (10 Kilo- ohm)**

| TEMP (C) | TEMP (F) | RESISTANCE (Ohms) |
|---|---|---|
| –40 | –40 | 335,651 |
| –35 | –31 | 242,195 |
| –30 | –22 | 176,683 |
| –25 | –13 | 130,243 |
| –20 | –4 | 96,974 |
| –15 | 5 | 72,895 |
| –10 | 14 | 55,298 |
| –5 | 23 | 42,315 |
| 0 | 32 | 32,651 |
| 5 | 41 | 25,395 |
| 10 | 50 | 19,903 |
| 15 | 59 | 15,714 |
| 20 | 68 | 12,494 |
| 25 | 77 | 10,000 |
| 30 | 86 | 8,056 |
| 35 | 95 | 6,530 |
| 40 | 104 | 5,325 |
| 45 | 113 | 4,367 |
| 50 | 122 | 3,601 |
| 55 | 131 | 2,985 |
| 60 | 140 | 2,487 |
| 65 | 149 | 2,082 |
| 70 | 158 | 1,752 |

SMOKE DETECTOR/FIRE ALARM SHUTDOWN (FSD) — To allow a smoke detector to shut the 50BV down, remove the jumper from FSD to C and wire these terminals to a set of normally closed contacts on the smoke detector.

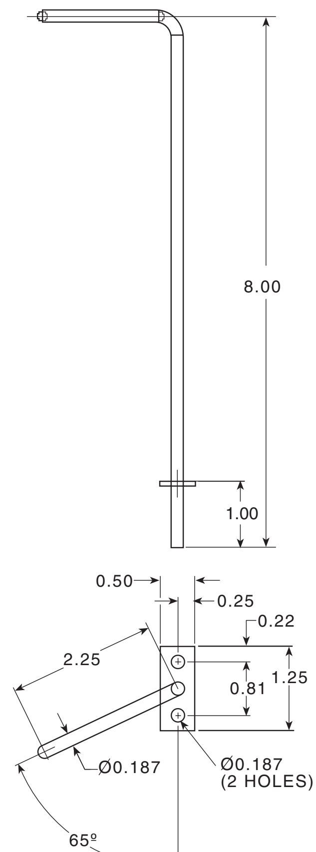
ALARM (ALARM) AND WARNING (WARN) OUTPUTS — Two dry contacts output a discrete signal when the alarm and warning lights on the display are lit. To pick up the alarm output signal, wire between the ALARM and ALM-CM terminals. To pick up the warning output signal, wire between the WARN and ALM-CM terminals.

REMOTE OCCUPANCY (ROCC) — The 50BV unit may be commanded by another control system or a twist timer to become occupied and run when a set of dry contacts close. In order for this to occur, wire the contacts to ROCC and C and set the Local/Off/Remote switch to REMOTE.

RETURN AIR TEMPERATURE SENSOR (RAS) — The return/mixed air temperature sensor is a 5 kiloohm temperature sensor used as the space control point. For every degree that the RAS is below the set point, the supply air set point will be reset by the configured value in the custom configured RESET RATIO. Refer to Table 12 and Fig. 31.

**Table 12 — Thermistor Resistance vs Temperature Values for Return-Air Temperature Sensor (5 kiloohm)**

| TEMP (C) | TEMP (F) | RESISTANCE (Ohms) |
|---|---|---|
| –40 | –40 | 167,835 |
| –35 | –31 | 121,098 |
| –30 | –22 | 88,340 |
| –25 | –13 | 65,121 |
| –20 | –4 | 48,487 |
| –15 | 5 | 36,447 |
| –10 | 14 | 27,648 |
| –5 | 23 | 21,157 |
| 0 | 32 | 16,325 |
| 5 | 41 | 12,697 |
| 10 | 50 | 9,952 |
| 15 | 59 | 7,857 |
| 20 | 68 | 6,247 |
| 25 | 77 | 5,000 |
| 30 | 86 | 4,028 |
| 35 | 95 | 3,265 |
| 40 | 104 | 2,662 |
| 45 | 113 | 2,183 |
| 50 | 122 | 1,801 |
| 55 | 131 | 1,493 |
| 60 | 140 | 1,244 |
| 65 | 149 | 1,041 |
| 70 | 158 | 876 |
| 75 | 167 | 740 |
| 80 | 176 | 628 |




NOTE: All dimensions are in inches.

**Fig. 31 — Return Air Temperature Sensor (P/N HH79NZ079)**

Wire the sensor to PCB1 connector J3, terminals 15 and 16. Change custom configuration as instructed in Configure the Custom Programming Selections section. Changing this configuration to YES changes the EWT input to be used as return air temperature input.

## START-UP

**General —** Complete the Start-Up Checklist on page CL-1 before attempting system start-up.

CRANKCASE HEATERS — The 50BVT,U,V,W,X034-064 units include crankcase heaters. Crankcase heaters are energized as long as there is power to the unit and the compressor is not operating.

*Wait 24 hours before starting the compressors to permit warming by the crankcase heaters.*

*AFTER 24 hours*, continue with the procedures below.

CONFIRM THE INPUT POWER PHASE SEQUENCE — The input power phase rotation sequence must be L1-L2-L3 = ABC (or forward or clockwise) as indicated with a phase rotation meter. Incorrect input phase rotation will cause the compressors to rotate in reverse, which results in no cooling capacity.

> IMPORTANT: On VAV units, fan rotation direction can NOT be used for the phase sequence check; fan rotation for VAV units with a variable speed drive is independent of the unit input wiring sequence.

If the compressor is rotating in the wrong direction, it may: emit increased noise; shut down due to internal overload protection; have only a small decrease in suction pressure when it starts; or have only a small increase in discharge pressure

when it starts. Also, no cooling will be produced at the evaporator. If any of these conditions occurs, refer to the Service section to correct the compressor rotation before continuing.

INTERNAL WIRING — Check all electrical connections in unit control boxes; tighten as required.

RETURN-AIR FILTERS — Check that correct filters are installed in filter tracks (see Tables 3A and 3B). Do not operate unit without return-air filters.

COMPRESSOR MOUNTING — Compressors are internally spring mounted. Do not loosen or remove compressor hold-down bolts.

REFRIGERANT SERVICE PORTS — Each refrigerant system has a total of 2 Schrader-type service gage ports per circuit. One port is located on the suction line, and one on the compressor discharge line. Be sure that caps on the ports are tight.

## CV Unit Start-Up

EVAPORATOR FAN — Fan belt and variable pitch motor pulleys are factory installed. See Tables 13-20 for fan performance data. Be sure that fans rotate in the proper direction.

COOLING — Set the space thermostat to OFF position. Turn on unit power. Set space thermostat to COOL and the fan to AUTO. Adjust the thermostat temperature setting below room temperature. Compressor 1 starts on closure of contactor (compressors 1 and 2 on 4-circuit units with 2-stage thermostat).

Adjust the thermostat to an even lower setting until the thermostat energizes Y2 (the second cooling stage). Compressor 2 starts on closure of contactor (compressors 3 and 4 on 4-circuit units with 2-stage thermostat).

Adjust the thermostat temperature to a setting just below room temperature. The second stage of cooling should turn off.

Set the thermostat temperature above room temperature. All compressors and the unit fan should now be off.

HEATING (Heat Pump Units Only) — Follow the same sequence as for cooling (above), except set the space thermostat to HEAT, and instead of adjusting the thermostat below room temperature, adjust it above. Verify that the compressors turn on and the unit runs in reverse cycle mode.

Set the thermostat below room temperature and confirm that the compressors and fan turn off.

### Table 13 — Fan Performance — 50BVC,E,Q020

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 4500 | — | — | — | — | — | — | *623* | *459* | *0.52* | — | — | — | — | — | — |
| 5000 | — | — | — | — | — | — | *638* | *545* | *0.61* | — | — | — | — | — | — |
| 5500 | — | — | — | — | — | — | *655* | *641* | *0.72* | *725* | *755* | *0.85* | — | — | — |
| 6000 | — | — | — | *608* | *641* | *0.72* | *676* | *755* | *0.85* | *742* | *878* | *0.99* | 807 | 1001 | 1.13 |
| 6500 | — | — | — | *636* | *755* | *0.85* | *699* | *878* | *0.99* | 761 | 1010 | 1.14 | 821 | 1142 | 1.29 |
| 7000 | *604* | *774* | *0.87* | *666* | *906* | *1.02* | *726* | *1029* | *1.16* | 784 | 1170 | 1.32 | 841 | 1311 | 1.48 |
| 7500 | *634* | *916* | *1.03* | *693* | *1057* | *1.19* | *750* | *1189* | *1.34* | 805 | 1330 | 1.50 | 858 | 1480 | 1.67 |
| 8000 | *667* | *1085* | *1.22* | *723* | *1226* | *1.38* | 777 | 1377 | 1.55 | 829 | 1526 | 1.72 | 880 | 1676 | 1.89 |
| 8500 | *700* | *1273* | *1.43* | 753 | 1423 | 1.60 | 804 | 1573 | 1.77 | 853 | 1732 | 1.95 | 902 | 1836 | 2.13 |
| 9000 | *735* | *1480* | *1.67* | 785 | 1638 | 1.84 | 833 | 1745 | 2.02 | 881 | 1908 | 2.21 | 927 | 2071 | 2.40 |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 4500 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 5000 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 5500 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 6000 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 6500 | 881 | 1283 | 1.44 | — | — | — | — | — | — | — | — | — | — | — | — |
| 7000 | 897 | 1451 | 1.63 | 951 | 1601 | 1.80 | — | — | — | — | — | — | — | — | — |
| 7500 | 911 | 1629 | 1.83 | 963 | 1727 | 2.00 | 1014 | 1881 | 2.18 | — | — | — | — | — | — |
| 8000 | 930 | 1781 | 2.07 | 979 | 1935 | 2.24 | 1028 | 2098 | 2.43 | 1076 | 2260 | 2.62 | 1124 | 2422 | 2.81 |
| 8500 | 950 | 1989 | 2.31 | 997 | 2152 | 2.50 | 1043 | 2323 | 2.69 | 1089 | 2485 | 2.88 | 1134 | 2697 | 3.09 |
| 9000 | 973 | 2233 | 2.59 | 1018 | 2404 | 2.79 | 1062 | 2576 | 2.99 | 1106 | 2779 | 3.18 | 1149 | 2960 | 3.39 |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:
1. Units are available with the following motor and drive combinations: 1.5, 2, 3, 5 HP standard drive; 1.5, 2, 3 HP medium static drive.
   For 1.5, 2, 3 HP standard drives, the drive range is 753 to 952 rpm. For medium static drives, the drive range is 872 to 1071 rpm. For 5 HP standard drives, the drive range is 967 to 1290 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded box] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. Bhp values are *per fan.* Watts values are *per motor.* Unit has 2 supply fans and 2 motors.

## Table 14 — Fan Performance — 50BVC,E,Q024

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **5,000** | — | — | — | — | — | — | *638* | *545* | *0.61* | — | — | — | — | — | — |
| **5,500** | — | — | — | — | — | — | *655* | *641* | *0.72* | *725* | *755* | *0.85* | — | — | — |
| **6,000** | — | — | — | *608* | *641* | *0.72* | *676* | *755* | *0.85* | *742* | *878* | *0.99* | 807 | 1001 | 1.13 |
| **6,500** | — | — | — | *636* | *755* | *0.85* | *699* | *878* | *0.99* | 761 | 1010 | 1.14 | 821 | 1142 | 1.29 |
| **7,000** | *604* | *774* | *0.87* | *666* | *906* | *1.02* | *726* | *1029* | *1.16* | 784 | 1170 | 1.32 | 841 | 1311 | 1.48 |
| **7,500** | *634* | *916* | *1.03* | *693* | *1057* | *1.19* | *750* | *1189* | *1.34* | 805 | 1330 | 1.50 | 858 | 1480 | 1.67 |
| **8,000** | *667* | *1085* | *1.22* | *723* | *1226* | *1.38* | 777 | 1377 | 1.55 | 829 | 1526 | 1.72 | 880 | 1676 | 1.89 |
| **8,500** | *700* | *1273* | *1.43* | 753 | 1423 | 1.60 | 804 | 1573 | 1.77 | 853 | 1732 | 1.95 | 902 | 1836 | 2.13 |
| **9,000** | *735* | *1480* | *1.67* | 785 | 1638 | 1.84 | 833 | 1745 | 2.02 | 881 | 1908 | 2.21 | 927 | 2071 | 2.40 |
| **9,500** | 769 | 1713 | 1.93 | 816 | 1827 | 2.12 | 863 | 1989 | 2.31 | 908 | 2152 | 2.50 | 952 | 2323 | 2.69 |
| **10,000** | 802 | 1908 | 2.21 | 848 | 2080 | 2.41 | 892 | 2251 | 2.61 | 936 | 2422 | 2.81 | 978 | 2624 | 3.01 |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **5,000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **5,500** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **6,000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **6,500** | 881 | 1283 | 1.44 | — | — | — | — | — | — | — | — | — | — | — | — |
| **7,000** | 897 | 1451 | 1.63 | 951 | 1601 | 1.80 | — | — | — | — | — | — | — | — | — |
| **7,500** | 911 | 1629 | 1.83 | 963 | 1727 | 2.00 | 1014 | 1881 | 2.18 | — | — | — | — | — | — |
| **8,000** | 930 | 1781 | 2.07 | 979 | 1935 | 2.24 | 1028 | 2098 | 2.43 | 1076 | 2260 | 2.62 | 1124 | 2422 | 2.81 |
| **8,500** | 950 | 1989 | 2.31 | 997 | 2152 | 2.50 | 1043 | 2323 | 2.69 | 1089 | 2485 | 2.88 | 1134 | 2697 | 3.09 |
| **9,000** | 973 | 2233 | 2.59 | 1018 | 2404 | 2.79 | 1062 | 2576 | 2.99 | 1106 | 2779 | 3.18 | 1149 | 2960 | 3.39 |
| **9,500** | 996 | 2494 | 2.89 | 1039 | 2697 | 3.09 | 1081 | 2879 | 3.30 | 1123 | 3060 | 3.51 | 1165 | 3251 | 3.73 |
| **10,000** | 1020 | 2806 | 3.22 | 1061 | 2988 | 3.42 | 1102 | 3178 | 3.64 | 1142 | 3360 | 3.85 | 1182 | 3559 | 4.08 |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:

1. Units are available with the following motor and drive combinations: 2, 3, and 5 HP standard drive; 2, 3 HP medium static drive.
   For 2, 3 HP standard drives, the drive range is 753 to 952 rpm.
   For medium static drives, the drive range is 872 to 1071 rpm.
   For 5 HP standard drives, the drive range is 967 to 1290 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. Bhp values are *per fan.* Watts values are *per motor.* Unit has 2 supply fans and 2 motors.

## Table 15 — Fan Performance — 50BVC,E,Q028

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **6,250** | — | — | — | ***624*** | ***678*** | ***0.79*** | ***689*** | ***797*** | ***0.92*** | 753 | 917 | 1.06 | 815 | 1045 | 1.21 |
| **7,000** | ***604*** | ***751*** | ***0.87*** | ***666*** | ***880*** | ***1.02*** | ***726*** | ***999*** | ***1.16*** | 784 | 1136 | 1.32 | 841 | 1273 | 1.48 |
| **7,500** | ***634*** | ***889*** | ***1.03*** | ***693*** | ***1027*** | ***1.19*** | ***750*** | ***1155*** | ***1.34*** | 805 | 1291 | 1.50 | 858 | 1437 | 1.67 |
| **8,000** | ***667*** | ***1054*** | ***1.22*** | ***723*** | ***1191*** | ***1.38*** | ***777*** | ***1337*** | ***1.55*** | 829 | 1482 | 1.72 | 880 | 1627 | 1.89 |
| **8,500** | ***700*** | ***1237*** | ***1.43*** | ***753*** | ***1382*** | ***1.60*** | ***804*** | ***1528*** | ***1.77*** | 853 | 1682 | 1.95 | 902 | 1836 | 2.13 |
| **9,000** | ***735*** | ***1437*** | ***1.67*** | ***785*** | ***1591*** | ***1.84*** | ***833*** | ***1745*** | ***2.02*** | 881 | 1908 | 2.21 | 927 | 2071 | 2.40 |
| **9,500** | ***769*** | ***1664*** | ***1.93*** | ***816*** | ***1827*** | ***2.12*** | ***863*** | ***1989*** | ***2.31*** | 908 | 2152 | 2.50 | 952 | 2323 | 2.69 |
| **10,000** | ***802*** | ***1908*** | ***2.21*** | ***848*** | ***2080*** | ***2.41*** | ***892*** | ***2251*** | ***2.61*** | 936 | 2422 | 2.81 | 978 | 2624 | 3.01 |
| **10,500** | ***835*** | ***2179*** | ***2.53*** | ***879*** | ***2350*** | ***2.73*** | ***921*** | ***2531*** | ***2.93*** | 963 | 2742 | 3.14 | 1004 | 2924 | 3.35 |
| **11,000** | ***870*** | ***2467*** | ***2.86*** | ***912*** | ***2688*** | ***3.08*** | ***952*** | ***2870*** | ***3.29*** | 992 | 3060 | 3.51 | 1032 | 3251 | 3.73 |
| **11,500** | ***904*** | ***2824*** | ***3.24*** | ***944*** | ***3015*** | ***3.46*** | 983 | 3206 | 3.67 | 1022 | 3405 | 3.90 | 1060 | 3605 | 4.13 |
| **12,000** | ***937*** | ***3169*** | ***3.63*** | 976 | 3369 | 3.86 | 1014 | 3569 | 4.09 | 1051 | 3777 | 4.33 | 1088 | 3985 | 4.57 |
| **12,500** | 972 | 3550 | 4.07 | 1010 | 3759 | 4.31 | 1046 | 3967 | 4.55 | 1082 | 4184 | 4.80 | — | — | — |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **6,250** | 877 | 1173 | 1.36 | — | — | — | — | — | — | — | — | — | — | — | — |
| **7,000** | 897 | 1410 | 1.63 | 951 | 1555 | 1.80 | — | — | — | — | — | — | — | — | — |
| **7,500** | 911 | 1582 | 1.83 | 963 | 1727 | 2.00 | 1014 | 1881 | 2.18 | — | — | — | — | — | — |
| **8,000** | 930 | 1781 | 2.07 | 979 | 1935 | 2.24 | 1028 | 2098 | 2.43 | 1076 | 2260 | 2.62 | 1124 | 2422 | 2.81 |
| **8,500** | 950 | 1989 | 2.31 | 997 | 2152 | 2.50 | 1043 | 2323 | 2.69 | 1089 | 2485 | 2.88 | 1134 | 2697 | 3.09 |
| **9,000** | 973 | 2233 | 2.59 | 1018 | 2404 | 2.79 | 1062 | 2576 | 2.99 | 1106 | 2779 | 3.18 | 1149 | 2960 | 3.39 |
| **9,500** | 996 | 2494 | 2.89 | 1039 | 2697 | 3.09 | 1081 | 2879 | 3.30 | 1123 | 3060 | 3.51 | 1165 | 3251 | 3.73 |
| **10,000** | 1020 | 2806 | 3.22 | 1061 | 2988 | 3.42 | 1102 | 3178 | 3.64 | 1142 | 3360 | 3.85 | 1182 | 3559 | 4.08 |
| **10,500** | 1044 | 3106 | 3.56 | 1084 | 3296 | 3.78 | 1123 | 3496 | 4.01 | 1161 | 3686 | 4.23 | 1200 | 3886 | 4.45 |
| **11,000** | 1070 | 3451 | 3.95 | 1109 | 3641 | 4.17 | 1146 | 3840 | 4.40 | 1184 | 4049 | 4.64 | 1220 | 4248 | 4.87 |
| **11,500** | 1097 | 3804 | 4.36 | 1134 | 4012 | 4.60 | 1170 | 4221 | 4.84 | 1206 | — | — | — | — | — |
| **12,000** | 1124 | 4193 | 4.81 | — | — | — | — | — | — | — | — | — | — | — | — |
| **12,500** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:
1. Units are available with 3 or 5 HP standard drive or 3 HP medium static drive.
   For 3 HP standard drives, the drive range is 753 to 952 rpm. For medium static drives, the drive range is 872 to 1071 rpm. 5 HP standard drives have drive range of 967 to 1290 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded box] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. Bhp values are *per fan.* Watts values are *per motor.* Unit has 2 supply fans and 2 motors.

## Table 16 — Fan Performance — 50BVC,E,Q034

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 9,000 | *639* | *1187* | *1.36* | *693* | *1334* | *1.53* | *745* | *1490* | *1.71* | *795* | *1646* | *1.89* | *843* | *1802* | *2.07* |
| 9,500 | *665* | *1362* | *1.56* | *717* | *1518* | *1.74* | *766* | *1674* | *1.92* | *814* | *1839* | *2.11* | *861* | *2004* | *2.30* |
| 10,000 | *693* | *1555* | *1.78* | *743* | *1720* | *1.97* | *791* | *1894* | *2.17* | *836* | *2058* | *2.36* | *881* | *2232* | *2.56* |
| 10,500 | *721* | *1775* | *2.03* | *769* | *1949* | *2.23* | *815* | *2122* | *2.43* | *859* | *2296* | *2.63* | *902* | *2478* | *2.84* |
| 11,000 | *749* | *2004* | *2.30* | *795* | *2186* | *2.51* | *840* | *2369* | *2.71* | *882* | *2551* | *2.92* | *924* | *2742* | *3.14* |
| 11,500 | *777* | *2259* | *2.59* | *822* | *2451* | *2.81* | *864* | *2642* | *3.03* | *906* | *2833* | *3.25* | *946* | *3024* | *3.47* |
| 12,000 | *805* | *2533* | *2.90* | *848* | *2733* | *3.13* | *889* | *2933* | *3.36* | *929* | *3133* | *3.59* | 968 | 3333 | 3.82 |
| 12,500 | *835* | *2842* | *3.26* | *877* | *3042* | *3.49* | *917* | *3251* | *3.73* | *955* | *3460* | *3.97* | 993 | 3668 | 4.20 |
| 13,000 | *865* | *3169* | *3.63* | *905* | *3378* | *3.87* | *944* | *3596* | *4.12* | 981 | 3813 | 4.37 | 1018 | 4021 | 4.61 |
| 13,500 | *894* | *3514* | *4.03* | *933* | *3741* | *4.29* | 971 | 3958 | 4.54 | 1007 | 4184 | 4.80 | — | — | — |
| 14,000 | *924* | *3895* | *4.46* | *961* | *4121* | *4.72* | 998 | 4356 | 4.99 | — | — | — | — | — | — |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 9,000 | *890* | *1958* | *2.24* | *936* | *2122* | *2.43* | 982 | 2296 | 2.63 | 1026 | 2460 | 2.82 | 1071 | 2642 | 3.03 |
| 9,500 | *906* | *2168* | *2.48* | *950* | *2341* | *2.68* | 994 | 2515 | 2.88 | 1037 | 2688 | 3.08 | 1079 | 2870 | 3.29 |
| 10,000 | *925* | *2405* | *2.76* | 967 | 2578 | 2.96 | 1009 | 2760 | 3.16 | 1051 | 2942 | 3.37 | 1092 | 3124 | 3.58 |
| 10,500 | *944* | *2660* | *3.05* | 986 | 2842 | 3.26 | 1026 | 3024 | 3.47 | 1066 | 3215 | 3.68 | 1105 | 3405 | 3.90 |
| 11,000 | *965* | *2924* | *3.35* | 1004 | 3115 | 3.57 | 1043 | 3315 | 3.80 | 1082 | 3505 | 4.02 | 1120 | 3705 | 4.25 |
| 11,500 | 985 | 3224 | 3.69 | 1024 | 3414 | 3.91 | 1062 | 3614 | 4.14 | 1099 | 3813 | 4.37 | 1136 | 4021 | 4.61 |
| 12,000 | 1006 | 3532 | 4.05 | 1044 | 3732 | 4.28 | 1080 | 3940 | 4.52 | 1117 | 4148 | 4.75 | 1152 | 4356 | 4.99 |
| 12,500 | 1030 | 3877 | 4.44 | 1066 | 4085 | 4.68 | 1102 | 4302 | 4.93 | — | — | — | — | — | — |
| 13,000 | 1053 | 4239 | 4.86 | — | — | — | — | — | — | — | — | — | — | — | — |
| 13,500 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 14,000 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:
1. Unit is available with 5 HP standard drive only. The drive range is 967 to 1290 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded box] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. Bhp values are *per fan.* Watts values are *per motor.* Unit has 2 supply fans and 2 motors.

## Table 17 — Fan Performance — 50BVT,U,V034

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **9,000** | *564* | *3,167* | *3.76* | *605* | *3,483* | *4.13* | *645* | *3,798* | *4.51* | *683* | *4,112* | *4.88* | *718* | *4,392* | *5.21* |
| **9,500** | *590* | *3,666* | *4.35* | *629* | *3,999* | *4.74* | *667* | *4,331* | *5.14* | *704* | *4,671* | *5.54* | *738* | *4,977* | *5.90* |
| **10,000** | *617* | *4,226* | *5.01* | *655* | *4,584* | *5.44* | *691* | *4,933* | *5.85* | *726* | *5,282* | *6.27* | *761* | *5,654* | *6.71* |
| **10,500** | *643* | *4,820* | *5.72* | *678* | *5,194* | *6.16* | *713* | *5,583* | *6.62* | *747* | *5,963* | *7.07* | *780* | *6,263* | *7.51* |
| **11,000** | *669* | *5,503* | *6.53* | *704* | *5,901* | *7.00* | *737* | *6,298* | *7.47* | *770* | *6,612* | *7.93* | *802* | *7,005* | *8.40* |
| **11,500** | *696* | *6,236* | *7.40* | *729* | *6,577* | *7.89* | *761* | *6,987* | *8.38* | *792* | *7,388* | *8.86* | 823 | 7,798 | 9.36 |
| **12,000** | *722* | *6,952* | *8.34* | *754* | *7,380* | *8.85* | *784* | *7,798* | *9.36* | 815 | 8,225 | 9.87 | 845 | 8,510 | 10.38 |
| **12,500** | *750* | *7,816* | *9.38* | *780* | *8,260* | *9.91* | 810 | 8,561 | 10.44 | 839 | 8,990 | 10.97 | 868 | 9,427 | 11.50 |
| **13,000** | *777* | *8,595* | *10.49* | 806 | 9,050 | 11.04 | 835 | 9,504 | 11.59 | 863 | 9,949 | 12.14 | 891 | 10,403 | 12.69 |
| **13,500** | *804* | *9,572* | *11.68* | 832 | 10,043 | 12.25 | 860 | 10,514 | 12.83 | 887 | 10,985 | 13.40 | 914 | 11,447 | 13.96 |
| **14,000** | 832 | 10,634 | 12.97 | 859 | 11,122 | 13.57 | 886 | 11,610 | 14.16 | 912 | 12,097 | 14.76 | 938 | 12,585 | 15.35 |
| **14,500** | 859 | 11,747 | 14.33 | 885 | 12,217 | 14.90 | 911 | 12,756 | 15.56 | 936 | 13,260 | 16.18 | 962 | 13,765 | 16.79 |
| **15,000** | 886 | 12,953 | 15.80 | 911 | 13,474 | 16.44 | 936 | 13,996 | 17.07 | 961 | 14,517 | 17.71 | 986 | 15,038 | 18.34 |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **9,000** | *751* | *4,663* | *5.53* | 785 | 4,933 | 5.85 | 817 | 5,212 | 6.18 | 849 | 5,512 | 6.54 | 881 | 5,804 | 6.89 |
| **9,500** | *771* | *5,264* | *6.25* | 802 | 5,574 | 6.61 | 834 | 5,866 | 6.96 | 864 | 6,166 | 7.31 | 895 | 6,394 | 7.67 |
| **10,000** | 792 | 5,963 | 7.07 | 822 | 6,272 | 7.44 | 852 | 6,498 | 7.80 | 882 | 6,804 | 8.16 | 911 | 7,118 | 8.54 |
| **10,500** | 812 | 6,603 | 7.92 | 841 | 6,926 | 8.31 | 870 | 7,240 | 8.69 | 899 | 7,563 | 9.07 | 927 | 7,885 | 9.46 |
| **11,000** | 833 | 7,388 | 8.86 | 861 | 7,720 | 9.26 | 889 | 8,051 | 9.66 | 917 | 8,253 | 10.07 | 944 | 8,578 | 10.46 |
| **11,500** | 854 | 8,199 | 9.84 | 882 | 8,441 | 10.30 | 909 | 8,784 | 10.72 | 936 | 9,127 | 11.13 | 962 | 9,469 | 11.55 |
| **12,000** | 874 | 8,921 | 10.88 | 903 | 9,332 | 11.38 | 930 | 9,701 | 11.83 | 955 | 10,060 | 12.27 | 981 | 10,420 | 12.71 |
| **12,500** | 896 | 9,855 | 12.02 | 924 | 10,283 | 12.54 | 951 | 10,702 | 13.06 | 976 | 11,079 | 13.51 | 1001 | 11,456 | 13.97 |
| **13,000** | 919 | 10,857 | 13.24 | 945 | 11,302 | 13.79 | 972 | 11,747 | 14.33 | 997 | 12,166 | 14.84 | 1022 | 12,551 | 15.31 |
| **13,500** | 941 | 11,918 | 14.54 | 967 | 12,380 | 15.10 | 993 | 12,850 | 15.67 | 1018 | 13,303 | 16.23 | 1042 | 13,722 | 16.74 |
| **14,000** | 964 | 13,064 | 15.94 | 990 | 13,551 | 16.53 | 1015 | 14,030 | 17.11 | 1040 | 14,517 | 17.71 | 1064 | 14,979 | 18.27 |
| **14,500** | 987 | 14,269 | 17.41 | 1011 | 14,765 | 18.01 | 1036 | 15,261 | 18.62 | 1060 | 15,765 | 19.23 | 1084 | 16,260 | 19.83 |
| **15,000** | 1010 | 15,560 | 18.98 | 1034 | 16,081 | 19.62 | — | — | — | — | — | — | — | — | — |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:

1. Unit is available with the following motor and drive combinations: 7.5, 10, 15, 20 HP standard drive; 7.5, 10, 15, 20 HP medium-static drive; 7.5, 10, 15, 20 HP high-static drive.

   For 7.5 HP standard drives, the drive range is 780 to 960 rpm. For 10, 15, 20 HP standard and 7.5 HP medium-static drives, the drive range is 805 to 991 rpm. For 10, 15, 20 HP medium-static and 7.5 HP high-static drives the drive range is 960 to 1146 rpm. For 10, 15, 20 HP high-static drives the drive range is 1119 to 1335 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded box] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. This unit has one supply fan and one fan motor.

## Table 17 — Fan Performance — 50BVT,U,V034 (cont)

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.2 | | | 2.4 | | | 2.6 | | | 2.8 | | | 3.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **9,000** | 912 | 6,095 | 7.23 | 943 | 6,324 | 7.59 | 974 | 6,629 | 7.95 | 1005 | 6,943 | 8.33 | 1035 | 7,266 | 8.72 |
| **9,500** | 925 | 6,690 | 8.03 | 955 | 6,996 | 8.39 | 984 | 7,310 | 8.77 | 1013 | 7,624 | 9.15 | 1042 | 7,955 | 9.54 |
| **10,000** | 940 | 7,423 | 8.91 | 969 | 7,746 | 9.29 | 997 | 8,060 | 9.67 | 1025 | 8,253 | 10.07 | 1053 | 8,578 | 10.46 |
| **10,500** | 955 | 8,199 | 9.84 | 982 | 8,390 | 10.23 | 1010 | 8,715 | 10.63 | 1037 | 9,041 | 11.03 | 1063 | 9,375 | 11.44 |
| **11,000** | 971 | 8,913 | 10.87 | 998 | 9,238 | 11.27 | 1024 | 9,572 | 11.68 | 1050 | 9,915 | 12.09 | 1076 | 10,257 | 12.51 |
| **11,500** | 988 | 9,812 | 11.97 | 1014 | 10,155 | 12.39 | 1040 | 10,506 | 12.82 | 1065 | 10,848 | 13.23 | 1090 | 11,207 | 13.67 |
| **12,000** | 1006 | 10,771 | 13.14 | 1031 | 11,130 | 13.58 | 1056 | 11,490 | 14.02 | 1080 | 11,849 | 14.45 | 1104 | 12,217 | 14.90 |
| **12,500** | 1025 | 11,824 | 14.42 | 1050 | 12,191 | 14.87 | 1074 | 12,568 | 15.33 | 1097 | 12,944 | 15.79 | 1121 | 13,320 | 16.25 |
| **13,000** | 1045 | 12,936 | 15.78 | 1069 | 13,320 | 16.25 | 1092 | 13,714 | 16.73 | 1115 | 14,098 | 17.20 | 1138 | 14,492 | 17.68 |
| **13,500** | 1065 | 14,124 | 17.23 | 1088 | 14,526 | 17.72 | 1110 | 14,927 | 18.21 | 1133 | 15,329 | 18.70 | 1155 | 15,731 | 19.19 |
| **14,000** | 1086 | 15,397 | 18.78 | 1108 | 15,816 | 19.29 | 1131 | 16,235 | 19.80 | — | — | — | — | — | — |
| **14,500** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **15,000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3.2 | | | 3.4 | | | 3.6 | | | 3.8 | | | 4.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **9,000** | 1065 | 7,606 | 9.13 | 1095 | 7,946 | 9.53 | — | — | — | — | — | — | — | — | — |
| **9,500** | 1071 | 8,286 | 9.94 | 1100 | 8,493 | 10.36 | 1128 | 8,835 | 10.78 | 1157 | 9,195 | 11.22 | 1185 | 9,564 | 11.67 |
| **10,000** | 1081 | 8,904 | 10.86 | 1108 | 9,247 | 11.28 | 1136 | 9,598 | 11.71 | 1163 | 9,958 | 12.15 | 1190 | 10,326 | 12.60 |
| **10,500** | 1090 | 9,718 | 11.85 | 1116 | 10,060 | 12.27 | 1143 | 10,411 | 12.70 | 1169 | 10,771 | 13.14 | 1195 | 11,139 | 13.59 |
| **11,000** | 1102 | 10,608 | 12.94 | 1127 | 10,959 | 13.37 | 1153 | 11,319 | 13.81 | 1178 | 11,678 | 14.25 | 1203 | 12,046 | 14.69 |
| **11,500** | 1115 | 11,558 | 14.10 | 1139 | 11,918 | 14.54 | 1164 | 12,286 | 14.99 | 1188 | 12,653 | 15.43 | 1212 | 13,038 | 15.90 |
| **12,000** | 1128 | 12,585 | 15.35 | 1152 | 12,953 | 15.80 | 1176 | 13,329 | 16.26 | 1200 | 13,705 | 16.72 | 1223 | 14,090 | 17.19 |
| **12,500** | 1144 | 13,697 | 16.71 | 1167 | 14,073 | 17.17 | 1190 | 14,457 | 17.64 | 1213 | 14,850 | 18.12 | 1236 | 15,235 | 18.58 |
| **13,000** | 1160 | 14,876 | 18.15 | 1183 | 15,269 | 18.63 | 1205 | 15,662 | 19.11 | 1227 | 16,064 | 19.60 | — | — | — |
| **13,500** | 1177 | 16,132 | 19.68 | — | — | — | — | — | — | — | — | — | — | — | — |
| **14,000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **14,500** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **15,000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:

1. Unit is available with the following motor and drive combinations: 7.5, 10, 15, 20 HP standard drive; 7.5, 10, 15, 20 HP medium-static drive; 7.5, 10, 15, 20 HP high-static drive.

   For 7.5 HP standard drives, the drive range is 780 to 960 rpm. For 10, 15, 20 HP standard and 7.5 HP medium-static drives, the drive range is 805 to 991 rpm. For 10, 15, 20 HP medium-static and 7.5 HP high-static drives the drive range is 960 to 1146 rpm. For 10, 15, 20 HP high-static drives the drive range is 1119 to 1335 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded box] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. This unit has one supply fan and one fan motor.

## Table 18 — Fan Performance — 50BVT,U,V044

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 12,000 | *403* | *1057* | *1.25* | *461* | *1271* | *1.51* | *512* | *1458* | *1.73* | *561* | *1644* | *1.95* | *608* | *1838* | *2.18* |
| 12,500 | *413* | *1173* | *1.39* | *470* | *1395* | *1.66* | *519* | *1591* | *1.89* | *567* | *1785* | *2.12* | *613* | *1980* | *2.35* |
| 13,000 | *423* | *1280* | *1.52* | *478* | *1520* | *1.80* | *527* | *1723* | *2.04* | *573* | *1927* | *2.29* | *618* | *2130* | *2.53* |
| 13,500 | *436* | *1422* | *1.69* | *489* | *1661* | *1.97* | *537* | *1883* | *2.23* | *582* | *2086* | *2.47* | *626* | *2297* | *2.73* |
| 14,000 | *446* | *1546* | *1.83* | *498* | *1803* | *2.14* | *546* | *2033* | *2.41* | *589* | *2253* | *2.67* | *632* | *2465* | *2.92* |
| 14,500 | *459* | *1706* | *2.02* | *509* | *1962* | *2.33* | *557* | *2209* | *2.62* | *599* | *2438* | *2.89* | *640* | *2658* | *3.15* |
| 15,000 | *469* | *1847* | *2.19* | *518* | *2121* | *2.52* | *565* | *2385* | *2.83* | *607* | *2614* | *3.10* | *647* | *2843* | *3.37* |
| 16,000 | *495* | *2200* | *2.61* | *541* | *2482* | *2.94* | *585* | *2772* | *3.29* | *627* | *3036* | *3.60* | *665* | *3272* | *3.88* |
| 17,000 | *518* | *2570* | *3.05* | *562* | *2878* | *3.41* | *604* | *3176* | *3.77* | *645* | *3474* | *4.12* | *681* | *3736* | *4.43* |
| 17,500 | *531* | *2781* | *3.30* | *573* | *3097* | *3.67* | *614* | *3404* | *4.04* | *654* | *3710* | *4.40* | *691* | *3990* | *4.73* |
| 18,000 | *543* | *3001* | *3.56* | *584* | *3325* | *3.94* | *625* | *3640* | *4.32* | *664* | *3955* | *4.69* | *700* | *4252* | *5.04* |
| 19,000 | *568* | *3474* | *4.12* | *607* | *3815* | *4.53* | *646* | *4147* | *4.92* | *684* | *4488* | *5.32* | *720* | *4820* | *5.72* |
| 19,500 | *580* | *3728* | *4.42* | *619* | *4077* | *4.84* | *657* | *4418* | *5.24* | *693* | *4767* | *5.66* | *729* | *5107* | *6.06* |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 12,000 | *654* | *2042* | *2.42* | *700* | *2262* | *2.68* | — | — | — | — | — | — | — | — | — |
| 12,500 | *657* | *2183* | *2.59* | *702* | *2403* | *2.85* | *745* | *2640* | *3.13* | — | — | — | — | — | — |
| 13,000 | *661* | *2341* | *2.78* | *704* | *2561* | *3.04* | *746* | *2790* | *3.31* | — | — | — | — | — | — |
| 13,500 | *668* | *2517* | *2.99* | *709* | *2737* | *3.25* | *750* | *2974* | *3.53* | 791 | 3220 | 3.82 | — | — | — |
| 14,000 | *673* | *2693* | *3.19* | *713* | *2913* | *3.46* | *753* | *3150* | *3.74* | 792 | 3395 | 4.03 | — | — | — |
| 14,500 | *680* | *2886* | *3.42* | *719* | *3115* | *3.69* | *758* | *3351* | *3.98* | 796 | 3605 | 4.28 | 834 | 3859 | 4.33 |
| 15,000 | *686* | *3079* | *3.65* | *724* | *3316* | *3.93* | *762* | *3553* | *4.21* | 799 | 3806 | 4.52 | 836 | 4069 | 4.57 |
| 16,000 | *702* | *3518* | *4.17* | *739* | *3771* | *4.47* | *774* | *4016* | *4.76* | 810 | 4278 | 5.08 | 844 | 4540 | 5.11 |
| 17,000 | *717* | *3990* | *4.73* | *752* | *4252* | *5.04* | 786 | 4514 | 5.36 | 820 | 4785 | 5.68 | 853 | 5055 | 5.70 |
| 17,500 | *726* | *4252* | *5.04* | *760* | *4523* | *5.37* | 794 | 4793 | 5.69 | 827 | 5064 | 6.01 | 859 | 5353 | 6.02 |
| 18,000 | *735* | *4523* | *5.37* | *768* | *4802* | *5.70* | 801 | 5072 | 6.02 | 833 | 5371 | 6.37 | 865 | 5662 | 6.37 |
| 19,000 | *753* | *5107* | *6.06* | 785 | 5415 | 6.42 | 816 | 5707 | 6.77 | 848 | 5998 | 7.12 | 878 | 6298 | 7.09 |
| 19,500 | *762* | *5433* | *6.45* | 794 | 5733 | 6.80 | 825 | 6033 | 7.16 | 855 | 6263 | 7.51 | 885 | 6568 | 7.48 |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.2 | | | 2.4 | | | 2.6 | | | 2.8 | | | 3.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 12,000 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 12,500 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 13,000 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 13,500 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 14,000 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 14,500 | 871 | 4130 | 4.90 | — | — | — | — | — | — | — | — | — | — | — | — |
| 15,000 | 872 | 4340 | 5.15 | — | — | — | — | — | — | — | — | — | — | — | — |
| 16,000 | 879 | 4811 | 5.71 | 913 | 5099 | 6.05 | 947 | 5415 | 6.42 | 980 | 5724 | 6.79 | — | — | — |
| 17,000 | 886 | 5353 | 6.35 | 919 | 5645 | 6.70 | 951 | 5945 | 7.05 | 983 | 6254 | 7.42 | 1015 | 6507 | 7.81 |
| 17,500 | 891 | 5645 | 6.70 | 923 | 5936 | 7.04 | 955 | 6245 | 7.41 | 986 | 6481 | 7.78 | 1017 | 6795 | 8.15 |
| 18,000 | 897 | 5945 | 7.05 | 928 | 6245 | 7.41 | 959 | 6481 | 7.78 | 989 | 6786 | 8.14 | 1020 | 7109 | 8.53 |
| 19,000 | 908 | 6525 | 7.83 | 938 | 6830 | 8.19 | 968 | 7135 | 8.56 | 997 | 7449 | 8.94 | 1027 | 7772 | 9.32 |
| 19,500 | 915 | 6865 | 8.24 | 944 | 7170 | 8.60 | 973 | 7484 | 8.98 | 1002 | 7807 | 9.37 | 1031 | 8129 | 9.75 |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:
1. Unit is available with the following motor and drive combinations: 7.5, 10, 15 HP standard drive; 7.5, 10, 15 HP medium-static drive; 7.5, 10, 15 HP high-static drive.

   For 7.5 HP standard drives, the drive range is 780 to 960 rpm. For 10, 15 HP standard and 7.5 HP medium-static drives, the drive range is 805 to 991 rpm. For 10, 15 HP medium-static and 7.5 HP high-static drives the drive range is 960 to 1146 rpm. For 10, 15 HP high-static drives the drive range is 1119 to 1335 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded box] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. Bhp values are *per fan*. Watts values are *per motor*. Unit has 2 supply fans and 2 motors.

## Table 19 — Fan Performance — 50BVT,U,V054

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 15,000 | *489* | *1953* | *2.32* | *537* | *2227* | *2.64* | *582* | *2473* | *2.93* | *623* | *2711* | *3.22* | *663* | *2939* | *3.49* |
| 16,000 | *513* | *2315* | *2.75* | *559* | *2596* | *3.08* | *603* | *2878* | *3.41* | *642* | *3132* | *3.72* | *680* | *3369* | *4.00* |
| 17,000 | *540* | *2728* | *3.24* | *583* | *3027* | *3.59* | *624* | *3325* | *3.94* | *663* | *3605* | *4.28* | *699* | *3868* | *4.59* |
| 18,000 | *564* | *3167* | *3.76* | *605* | *3483* | *4.13* | *645* | *3798* | *4.51* | *683* | *4112* | *4.88* | *718* | *4392* | *5.21* |
| 18,500 | *578* | *3413* | *4.05* | *618* | *3745* | *4.44* | *657* | *4069* | *4.83* | *694* | *4392* | *5.21* | *729* | *4680* | *5.55* |
| 19,000 | *590* | *3666* | *4.35* | *629* | *3999* | *4.74* | *667* | *4331* | *5.14* | *704* | *4671* | *5.54* | *738* | *4977* | *5.90* |
| 19,500 | *604* | *3938* | *4.67* | *642* | *4278* | *5.08* | *679* | *4628* | *5.49* | *715* | *4968* | *5.89* | *749* | *5299* | *6.29* |
| 20,000 | *617* | *4226* | *5.01* | *655* | *4584* | *5.44* | *691* | *4933* | *5.85* | *726* | *5282* | *6.27* | *761* | *5654* | *6.71* |
| 20,500 | *629* | *4505* | *5.34* | *665* | *4872* | *5.78* | *701* | *5238* | *6.21* | *736* | *5618* | *6.67* | *770* | *5980* | *7.09* |
| 21,000 | *643* | *4820* | *5.72* | *678* | *5194* | *6.16* | *713* | *5583* | *6.62* | *747* | *5963* | *7.07* | 780 | 6263 | 7.51 |
| 22,000 | *669* | *5503* | *6.53* | *704* | *5901* | *7.00* | *737* | *6298* | *7.47* | *770* | *6612* | *7.93* | 802 | 7005 | 8.40 |
| 23,000 | *696* | *6236* | *7.40* | *729* | *6577* | *7.89* | *761* | *6987* | *8.38* | *792* | *7388* | *8.86* | 823 | 7798 | 9.36 |
| 24,000 | *722* | *6952* | *8.34* | *754* | *7380* | *8.85* | *784* | *7798* | *9.36* | 815 | 8225 | 9.87 | 845 | 8510 | 10.38 |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 15,000 | *701* | *3167* | *3.76* | *739* | *3413* | *4.05* | *777* | *3658* | *4.34* | 814 | 3,911 | 4.64 | 850 | 4,174 | 4.95 |
| 16,000 | *717* | *3623* | *4.30* | *753* | *3868* | *4.59* | 789 | 4121 | 4.89 | 824 | 4,383 | 5.20 | 858 | 4,654 | 5.52 |
| 17,000 | *734* | *4121* | *4.89* | *769* | *4383* | *5.20* | 803 | 4645 | 5.51 | 837 | 4,915 | 5.83 | 870 | 5,194 | 6.16 |
| 18,000 | *751* | *4663* | *5.53* | 785 | 4933 | 5.85 | 817 | 5212 | 6.18 | 849 | 5,512 | 6.54 | 881 | 5,804 | 6.89 |
| 18,500 | *762* | *4968* | *5.89* | 794 | 5247 | 6.22 | 826 | 5548 | 6.58 | 857 | 5,839 | 6.93 | 889 | 6,130 | 7.27 |
| 19,000 | *771* | *5264* | *6.25* | 802 | 5574 | 6.61 | 834 | 5866 | 6.96 | 864 | 6,166 | 7.31 | 895 | 6,394 | 7.67 |
| 19,500 | 781 | 5618 | 6.67 | 812 | 5919 | 7.02 | 843 | 6219 | 7.38 | 873 | 6,446 | 7.73 | 903 | 6,743 | 8.09 |
| 20,000 | 792 | 5963 | 7.07 | 822 | 6272 | 7.44 | 852 | 6498 | 7.80 | 882 | 6,804 | 8.16 | 911 | 7,118 | 8.54 |
| 20,500 | 801 | 6307 | 7.48 | 831 | 6542 | 7.85 | 860 | 6856 | 8.23 | 890 | 7,170 | 8.60 | 918 | 7,484 | 8.98 |
| 21,000 | 812 | 6603 | 7.92 | 841 | 6926 | 8.31 | 870 | 7240 | 8.69 | 899 | 7,563 | 9.07 | 927 | 7,885 | 9.46 |
| 22,000 | 833 | 7388 | 8.86 | 861 | 7720 | 9.26 | 889 | 8051 | 9.66 | 917 | 8,253 | 10.07 | 944 | 8,578 | 10.46 |
| 23,000 | 854 | 8199 | 9.84 | 882 | 8441 | 10.30 | 909 | 8784 | 10.72 | 936 | 9,127 | 11.13 | 962 | 9,469 | 11.55 |
| 24,000 | 874 | 8921 | 10.88 | 903 | 9332 | 11.38 | 930 | 9701 | 11.83 | 955 | 10,060 | 12.27 | 981 | 10,420 | 12.71 |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:
1. Unit is available with the following motor and drive combinations: 7.5, 10, 15, 20 HP standard drive; 7.5, 10, 15, 20 HP medium-static drive; 7.5, 10, 15, 20 HP high-static drive.

   For 7.5 HP standard drives, the drive range is 780 to 960 rpm. For 10, 15, 20 HP standard and 7.5 HP medium-static drives, the drive range is 805 to 991 rpm. For 10, 15, 20 HP medium-static and 7.5 HP high-static drives the drive range is 960 to 1146 rpm. For 10, 15, 20 HP high-static drives the drive range is 1119 to 1335 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded box] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. Bhp values are *per fan*. Watts values are *per motor*. Unit has 2 supply fans and 2 motors.

## Table 19 — Fan Performance — 50BVT,U,V054 (cont)

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.2 | | | 2.4 | | | 2.6 | | | 2.8 | | | 3.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **15,000** | 886 | 4,444 | 5.27 | 922 | 4,741 | 5.62 | 958 | 5,046 | 5.99 | 993 | 5,380 | 6.38 | — | — | — |
| **16,000** | 893 | 4,924 | 5.84 | 927 | 5,212 | 6.18 | 961 | 5,539 | 6.57 | 994 | 5,857 | 6.95 | — | — | — |
| **17,000** | 903 | 5,495 | 6.52 | 935 | 5,795 | 6.87 | 967 | 6,095 | 7.23 | 999 | 6,341 | 7.61 | 1031 | 6,664 | 8.00 |
| **18,000** | 912 | 6,095 | 7.23 | 943 | 6,324 | 7.59 | 974 | 6,629 | 7.95 | 1005 | 6,943 | 8.33 | 1035 | 7,266 | 8.72 |
| **18,500** | 919 | 6,359 | 7.63 | 950 | 6,664 | 8.00 | 980 | 6,970 | 8.36 | 1010 | 7,284 | 8.74 | 1039 | 7,606 | 9.13 |
| **19,000** | 925 | 6,690 | 8.03 | 955 | 6,996 | 8.39 | 984 | 7,310 | 8.77 | 1013 | 7,624 | 9.15 | 1042 | 7,955 | 9.54 |
| **19,500** | 932 | 7,048 | 8.46 | 962 | 7,362 | 8.83 | 991 | 7,676 | 9.21 | 1019 | 7,999 | 9.60 | 1047 | 8,330 | 9.99 |
| **20,000** | 940 | 7,423 | 8.91 | 969 | 7,746 | 9.29 | 997 | 8,060 | 9.67 | 1025 | 8,253 | 10.07 | 1053 | 8,578 | 10.46 |
| **20,500** | 946 | 7,798 | 9.36 | 975 | 8,121 | 9.74 | 1003 | 8,304 | 10.13 | 1030 | 8,630 | 10.53 | 1057 | 8,955 | 10.92 |
| **21,000** | 955 | 8,199 | 9.84 | 982 | 8,390 | 10.23 | 1010 | 8,715 | 10.63 | 1037 | 9,041 | 11.03 | 1063 | 9,375 | 11.44 |
| **22,000** | 971 | 8,913 | 10.87 | 998 | 9,238 | 11.27 | 1024 | 9,572 | 11.68 | 1050 | 9,915 | 12.09 | 1076 | 10,257 | 12.51 |
| **23,000** | 988 | 9,812 | 11.97 | 1014 | 10,155 | 12.39 | 1040 | 10,506 | 12.82 | 1065 | 10,848 | 13.23 | 1090 | 11,207 | 13.67 |
| **24,000** | 1006 | 10,771 | 13.14 | 1031 | 11,130 | 13.58 | 1056 | 11,490 | 14.02 | 1080 | 11,849 | 14.45 | 1104 | 12,217 | 14.90 |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3.2 | | | 3.4 | | | 3.6 | | | 3.8 | | | 4.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **15,000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **16,000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **17,000** | 1062 | 7,005 | 8.40 | 1093 | 7,353 | 8.82 | — | — | — | — | — | — | — | — | — |
| **18,000** | 1065 | 7,606 | 9.13 | 1095 | 7,946 | 9.53 | — | — | — | — | — | — | — | — | — |
| **18,500** | 1069 | 7,946 | 9.53 | 1098 | 8,286 | 9.94 | 1127 | 8,501 | 10.37 | 1156 | 8,861 | 10.81 | — | — | — |
| **19,000** | 1071 | 8,286 | 9.94 | 1100 | 8,493 | 10.36 | 1128 | 8,835 | 10.78 | 1157 | 9,195 | 11.22 | 1185 | 9,564 | 11.67 |
| **19,500** | 1076 | 8,518 | 10.39 | 1104 | 8,861 | 10.81 | 1132 | 9,212 | 11.24 | 1159 | 9,572 | 11.68 | 1187 | 9,932 | 12.12 |
| **20,000** | 1081 | 8,904 | 10.86 | 1108 | 9,247 | 11.28 | 1136 | 9,598 | 11.71 | 1163 | 9,958 | 12.15 | 1190 | 10,326 | 12.60 |
| **20,500** | 1084 | 9,298 | 11.34 | 1112 | 9,641 | 11.76 | 1138 | 9,992 | 12.19 | 1165 | 10,343 | 12.62 | 1191 | 10,711 | 13.07 |
| **21,000** | 1090 | 9,718 | 11.85 | 1116 | 10,060 | 12.27 | 1143 | 10,411 | 12.70 | 1169 | 10,771 | 13.14 | 1195 | 11,139 | 13.59 |
| **22,000** | 1102 | 10,608 | 12.94 | 1127 | 10,959 | 13.37 | 1153 | 11,319 | 13.81 | 1178 | 11,678 | 14.25 | 1203 | 12,046 | 14.69 |
| **23,000** | 1115 | 11,558 | 14.10 | 1139 | 11,918 | 14.54 | 1164 | 12,286 | 14.99 | 1188 | 12,653 | 15.43 | 1212 | 13,038 | 15.90 |
| **24,000** | 1128 | 12,585 | 15.35 | 1152 | 12,953 | 15.80 | 1176 | 13,329 | 16.26 | 1200 | 13,705 | 16.72 | 1223 | 14,090 | 17.19 |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:
1. Unit is available with the following motor and drive combinations: 7.5, 10, 15, 20 HP standard drive; 7.5, 10, 15, 20 HP medium-static drive; 7.5, 10, 15, 20 HP high-static drive.

   For 7.5 HP standard drives, the drive range is 780 to 960 rpm. For 10, 15, 20 HP standard and 7.5 HP medium-static drives, the drive range is 805 to 991 rpm. For 10, 15, 20 HP medium-static and 7.5 HP high-static drives the drive range is 960 to 1146 rpm. For 10, 15, 20 HP high-static drives the drive range is 1119 to 1335 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded box] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. Bhp values are *per fan*. Watts values are *per motor*. Unit has 2 supply fans and 2 motors.

## Table 20 — Fan Performance — 50BVT,U,V064

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 18,000 | *564* | *3,167* | *3.76* | *605* | *3,483* | *4.13* | *645* | *3,798* | *4.51* | *683* | *4,112* | *4.88* | *718* | *4,392* | *5.21* |
| 19,000 | *590* | *3,666* | *4.35* | *629* | *3,999* | *4.74* | *667* | *4,331* | *5.14* | *704* | *4,671* | *5.54* | *738* | *4,977* | *5.90* |
| 20,000 | *617* | *4,226* | *5.01* | *655* | *4,584* | *5.44* | *691* | *4,933* | *5.85* | *726* | *5,282* | *6.27* | *761* | *5,654* | *6.71* |
| 21,000 | *643* | *4,820* | *5.72* | *678* | *5,194* | *6.16* | *713* | *5,583* | *6.62* | *747* | *5,963* | *7.07* | *780* | *6,263* | *7.51* |
| 22,000 | *669* | *5,503* | *6.53* | *704* | *5,901* | *7.00* | *737* | *6,298* | *7.47* | *770* | *6,612* | *7.93* | *802* | *7,005* | *8.40* |
| 23,000 | *696* | *6,236* | *7.40* | *729* | *6,577* | *7.89* | *761* | *6,987* | *8.38* | *792* | *7,388* | *8.86* | 823 | 7,798 | 9.36 |
| 24,000 | *722* | *6,952* | *8.34* | *754* | *7,380* | *8.85* | *784* | *7,798* | *9.36* | 815 | 8,225 | 9.87 | 845 | 8,510 | 10.38 |
| 25,000 | *750* | *7,816* | *9.38* | *780* | *8,260* | *9.91* | 810 | 8,561 | 10.44 | 839 | 8,990 | 10.97 | 868 | 9,427 | 11.50 |
| 26,000 | *777* | *8,595* | *10.49* | 806 | 9,050 | 11.04 | 835 | 9,504 | 11.59 | 863 | 9,949 | 12.14 | 891 | 10,403 | 12.69 |
| 27,000 | *804* | *9,572* | *11.68* | 832 | 10,043 | 12.25 | 860 | 10,514 | 12.83 | 887 | 10,985 | 13.40 | 914 | 11,447 | 13.96 |
| 28,000 | 832 | 10,634 | 12.97 | 859 | 11,122 | 13.57 | 886 | 11,610 | 14.16 | 912 | 12,097 | 14.76 | 938 | 12,585 | 15.35 |
| 29,000 | 859 | 11,747 | 14.33 | 885 | 12,251 | 14.94 | 911 | 12,756 | 15.56 | 936 | 13,260 | 16.18 | 962 | 13,765 | 16.79 |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| 18,000 | *751* | *4,663* | *5.53* | 785 | 4,933 | 5.85 | 817 | 5,212 | 6.18 | 849 | 5,512 | 6.54 | 881 | 5,804 | 6.89 |
| 19,000 | *771* | *5,264* | *6.25* | 802 | 5,574 | 6.61 | 834 | 5,866 | 6.96 | 864 | 6,166 | 7.31 | 895 | 6,394 | 7.67 |
| 20,000 | 792 | 5,963 | 7.07 | 822 | 6,272 | 7.44 | 852 | 6,498 | 7.80 | 882 | 6,804 | 8.16 | 911 | 7,118 | 8.54 |
| 21,000 | 812 | 6,603 | 7.92 | 841 | 6,926 | 8.31 | 870 | 7,240 | 8.69 | 899 | 7,563 | 9.07 | 927 | 7,885 | 9.46 |
| 22,000 | 833 | 7,388 | 8.86 | 861 | 7,720 | 9.26 | 889 | 8,051 | 9.66 | 917 | 8,253 | 10.07 | 944 | 8,578 | 10.46 |
| 23,000 | 854 | 8,199 | 9.84 | 882 | 8,441 | 10.30 | 909 | 8,784 | 10.72 | 936 | 9,127 | 11.13 | 962 | 9,469 | 11.55 |
| 24,000 | 874 | 8,921 | 10.88 | 903 | 9,332 | 11.38 | 930 | 9,701 | 11.83 | 955 | 10,060 | 12.27 | 981 | 10,420 | 12.71 |
| 25,000 | 896 | 9,855 | 12.02 | 924 | 10,283 | 12.54 | 951 | 10,702 | 13.06 | 976 | 11,079 | 13.51 | 1001 | 11,456 | 13.97 |
| 26,000 | 919 | 10,857 | 13.24 | 945 | 11,302 | 13.79 | 972 | 11,747 | 14.33 | 997 | 12,166 | 14.84 | 1022 | 12,551 | 15.31 |
| 27,000 | 941 | 11,918 | 14.54 | 967 | 12,380 | 15.10 | 993 | 12,850 | 15.67 | 1018 | 13,303 | 16.23 | 1042 | 13,722 | 16.74 |
| 28,000 | 964 | 13,064 | 15.94 | 990 | 13,551 | 16.53 | 1015 | 14,030 | 17.11 | 1040 | 14,517 | 17.71 | 1064 | 14,979 | 18.27 |
| 29,000 | 987 | 14,269 | 17.41 | 1011 | 14,765 | 18.01 | 1036 | 15,261 | 18.62 | 1060 | 15,765 | 19.23 | 1084 | 16,260 | 19.83 |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:

1. Unit is available with the following motor and drive combinations: 7.5, 10, 15, 20 HP standard drive; 7.5, 10, 15, 20 HP medium-static drive; 7.5, 10, 15, 20 HP high-static drive.

   For 7.5 HP standard drives, the drive range is 780 to 960 rpm. For 10, 15, 20 HP standard and 7.5 HP medium-static drives, the drive range is 805 to 991 rpm. For 10, 15, 20 HP medium-static and 7.5 HP high-static drives the drive range is 960 to 1146 rpm. For 10, 15, 20 HP high-static drives the drive range is 1119 to 1335 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded box] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. Bhp values are *per fan*. Watts values are *per motor*. Unit has 2 supply fans and 2 motors.

## Table 20 — Fan Performance — 50BVT,U,V064 (cont)

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.2 | | | 2.4 | | | 2.6 | | | 2.8 | | | 3.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **18,000** | 912 | 6,095 | 7.23 | 943 | 6,324 | 7.59 | 974 | 6,629 | 7.95 | 1005 | 6,943 | 8.33 | 1035 | 7,266 | 8.72 |
| **19,000** | 925 | 6,690 | 8.03 | 955 | 6,996 | 8.39 | 984 | 7,310 | 8.77 | 1013 | 7,624 | 9.15 | 1042 | 7,955 | 9.54 |
| **20,000** | 940 | 7,423 | 8.91 | 969 | 7,746 | 9.29 | 997 | 8,060 | 9.67 | 1025 | 8,253 | 10.07 | 1053 | 8,578 | 10.46 |
| **21,000** | 955 | 8,199 | 9.84 | 982 | 8,390 | 10.23 | 1010 | 8,715 | 10.63 | 1037 | 9,041 | 11.03 | 1063 | 9,375 | 11.44 |
| **22,000** | 971 | 8,913 | 10.87 | 998 | 9,238 | 11.27 | 1024 | 9,572 | 11.68 | 1050 | 9,915 | 12.09 | 1076 | 10,257 | 12.51 |
| **23,000** | 988 | 9,812 | 11.97 | 1014 | 10,155 | 12.39 | 1040 | 10,506 | 12.82 | 1065 | 10,848 | 13.23 | 1090 | 11,207 | 13.67 |
| **24,000** | 1006 | 10,771 | 13.14 | 1031 | 11,130 | 13.58 | 1056 | 11,490 | 14.02 | 1080 | 11,849 | 14.45 | 1104 | 12,217 | 14.90 |
| **25,000** | 1025 | 11,824 | 14.42 | 1050 | 12,191 | 14.87 | 1074 | 12,568 | 15.33 | 1097 | 12,944 | 15.79 | 1121 | 13,320 | 16.25 |
| **26,000** | 1045 | 12,936 | 15.78 | 1069 | 13,320 | 16.25 | 1092 | 13,714 | 16.73 | 1115 | 14,098 | 17.20 | 1138 | 14,492 | 17.68 |
| **27,000** | 1065 | 14,124 | 17.23 | 1088 | 14,526 | 17.72 | 1110 | 14,927 | 18.21 | 1133 | 15,329 | 18.70 | 1155 | 15,731 | 19.19 |
| **28,000** | 1086 | 15,397 | 18.78 | 1108 | 15,816 | 19.29 | 1131 | 16,235 | 19.80 | — | — | — | — | — | — |
| **29,000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

| AIRFLOW (cfm) | AVAILABLE EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3.2 | | | 3.4 | | | 3.6 | | | 3.8 | | | 4.0 | | |
| | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp | Rpm | Watts | Bhp |
| **18,000** | 1065 | 7,606 | 9.13 | 1095 | 7,946 | 9.53 | — | — | — | — | — | — | — | — | — |
| **19,000** | 1071 | 8,286 | 9.94 | 1100 | 8,493 | 10.36 | 1128 | 8,835 | 10.78 | 1157 | 9,195 | 11.22 | 1185 | 9,564 | 11.67 |
| **20,000** | 1081 | 8,904 | 10.86 | 1108 | 9,247 | 11.28 | 1136 | 9,598 | 11.71 | 1163 | 9,958 | 12.15 | 1190 | 10,326 | 12.60 |
| **21,000** | 1090 | 9,718 | 11.85 | 1116 | 10,060 | 12.27 | 1143 | 10,411 | 12.70 | 1169 | 10,771 | 13.14 | 1195 | 11,139 | 13.59 |
| **22,000** | 1102 | 10,608 | 12.94 | 1127 | 10,959 | 13.37 | 1153 | 11,319 | 13.81 | 1178 | 11,678 | 14.25 | 1203 | 12,046 | 14.69 |
| **23,000** | 1115 | 11,558 | 14.10 | 1139 | 11,918 | 14.54 | 1164 | 12,286 | 14.99 | 1188 | 12,653 | 15.43 | 1212 | 13,038 | 15.90 |
| **24,000** | 1128 | 12,585 | 15.35 | 1152 | 12,953 | 15.80 | 1176 | 13,329 | 16.26 | 1200 | 13,705 | 16.72 | 1223 | 14,090 | 17.19 |
| **25,000** | 1144 | 13,697 | 16.71 | 1167 | 14,073 | 17.17 | 1190 | 14,457 | 17.64 | 1213 | 14,850 | 18.12 | 1236 | 15,235 | 18.58 |
| **26,000** | 1160 | 14,876 | 18.15 | 1183 | 15,269 | 18.63 | 1205 | 15,662 | 19.11 | 1227 | 16,064 | 19.60 | — | — | — |
| **27,000** | 1177 | 16,132 | 19.68 | — | — | — | — | — | — | — | — | — | — | — | — |
| **28,000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **29,000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

LEGEND

**Bhp** — Brake Horsepower Input to Supply Fan
**Watts** — Input Power to Supply Fan Motor

NOTES:
1. Unit is available with the following motor and drive combinations: 7.5, 10, 15, 20 HP standard drive; 7.5, 10, 15, 20 HP medium-static drive; 7.5, 10, 15, 20 HP high-static drive.
   For 7.5 HP standard drives, the drive range is 780 to 960 rpm. For 10, 15, 20 HP standard and 7.5 HP medium-static drives, the drive range is 805 to 991 rpm. For 10, 15, 20 HP medium-static and 7.5 HP high-static drives the drive range is 960 to 1146 rpm. For 10, 15, 20 HP high-static drives the drive range is 1119 to 1335 rpm.
2. ***Italics*** indicates field-supplied drive required.
3. [shaded box] Do not operate in shaded area.
4. Static pressure losses must be applied to external static pressure before entering the fan performance table.
5. Interpolation is permitted, extrapolation is not.
6. Fan performance is based on filter, unit casing and wet coil losses.
7. Bhp values are *per fan*. Watts values are *per motor*. Unit has 2 supply fans and 2 motors.

## VAV Unit Start-Up

PERFORM AUTOMATIC RUN TEST — The 50BVJ,K,W,X unit controls are programmed with an automatic run test that checks connection and operation of major components. To perform the run test:

Verify that the control display (LID [Local Interface Display] device/system monitor) interface cable is connected to internal jack on main controller; that the fire alarm/shutdown switch input (FSD) has a factory jumper or field input; and that the Local/Off/Remote switch is set to the REMOTE position (Fig. 17).

NOTE: When the Local/Off/Remote switch is in the REMOTE position, the controller time schedule is pre-set (from the factory) as unoccupied. This means that the unit will not turn on until the run test is enabled. However, if the controller schedule has already been modified in the field, and the current time of day is occupied, then the supply fan will start. The run test will shut the fan down when it begins. The run test will complete and then the supply fan will automatically restart.

NOTE: If the Local/Off/Remote switch is in the OFF position, it is normal for the red alarm light on the display panel to be lit, indicating that the unit is disabled.

NOTE: If the light stays on when the switch is moved to REMOTE, or if any other problems occur during the run test, refer to the Troubleshooting section of this manual.

To perform the run test:

1. Turn unit power on.

   The LID display will show the controller identification, time, and date (Fig. 32):

   OMNIZONE VPAC

   hh:mm mm-dd-yy
2. Press 3 and then [SET]. The LID display will show:

   Controller Password
3. Press [ENTER]. The LID display will show:

   Log in to Controller

   Enter Password

   NOTE: The LID display has two modes: Edit mode and Status/Maintenance mode. If the LID display is in Edit mode, then the display will only show the word “password.” Press the [EXPN/EDIT] key to toggle to the Status mode.

   Press the [EXPN/EDIT] to display:

   Log in to Controller

   Enter Password
4. Key in the password and press [ENTER].

   NOTE: The default password is 1111.
5. The LID display will show:

   Log in to Controller

   Logged In
6. Press 37 [ALGO]. The display will show:

   Custom Program
7. Press [ENTER]. The display will show:

   2.0 Global Dictionary

   OMNIZONE
8. Press [EXPN/EDIT] (NOTE: Display will flash and is now in edit mode.) The display will show:

   2.0 Global Dictionary

   OMNIZONE
9. Press [ENTER]. The display will show:

   Compressor Stages

   2.00 (sizes 020-034)

   4.00 (sizes 044-064)
10. If the number of compressor stages displayed is incorrect, then enter the correct number. Input 2.00 for sizes 020-034 or 4.00 for sizes 044-064, then Press [ENTER]. The display will show:

    Compressor Stages

    2.00 (sizes 020-034)

    4.00 (sizes 044-064)
11. Press [STAT]. The LID display will show:

    Hardware Points
12. Press [STAT] again. The LID display will show:

    Software Points
13. Press [ENTER]. The LID display will show:

    Compressor 1 Status
14. Press [▼] 6 times. The LID display will show:

    Factory/Field Test

    Stop
15. Press 1 then [ENTER], The LID display will show:

    Factory/Field Test

    Start

NOTE: At this point, the yellow warning light on the display panel will be lit and will stay on throughout the run test. After each successful step, the red alarm light will blink once.

16. The control module will now check if there is input from DHS, FSD, SAT, DSP, and CSMUX.

    If the control does not receive open/closed/in range/in range/in range, the red alarm LED will go on and the test will stop.

    If the inputs are okay, the red alarm LED blinks once and the test continues.
17. Next, the control forces the supply fan (SF) and all of the compressors (COMP) off, and waits 15 seconds.
18. The control forces SF on and SPEED to 20 percent and then waits 30 seconds.

    If the VFD display shows: 12.0 Hz, the remote and auto LEDs blink, and the fan goes on, then the red LED on the control module blinks once and the test continues.
19. The control forces SF on and SPEED to 35 percent and then waits 30 seconds.

    If the VFD display shows: 21.0 Hz, the remote and auto LEDs blink, and the fan goes on, then the red LED on the control module blinks once and the test continues.
20. The control forces SF off then waits 15 seconds.

    If the VFD display shows: Off, the remote and auto LEDs are off, and the fan goes off, then the red LED on the control module blinks once and the test continues.

NOTE: The steps below will be completed for the number of compressors configured.

21. The control forces CMP1 (compressor 1) on then waits 5 seconds.

    If CSMUX is not in range, the red LED will go on and the test will stop.

    If CSMUX is in range, the red LED blinks once and the test continues.
22. The control forces CMP1 off.

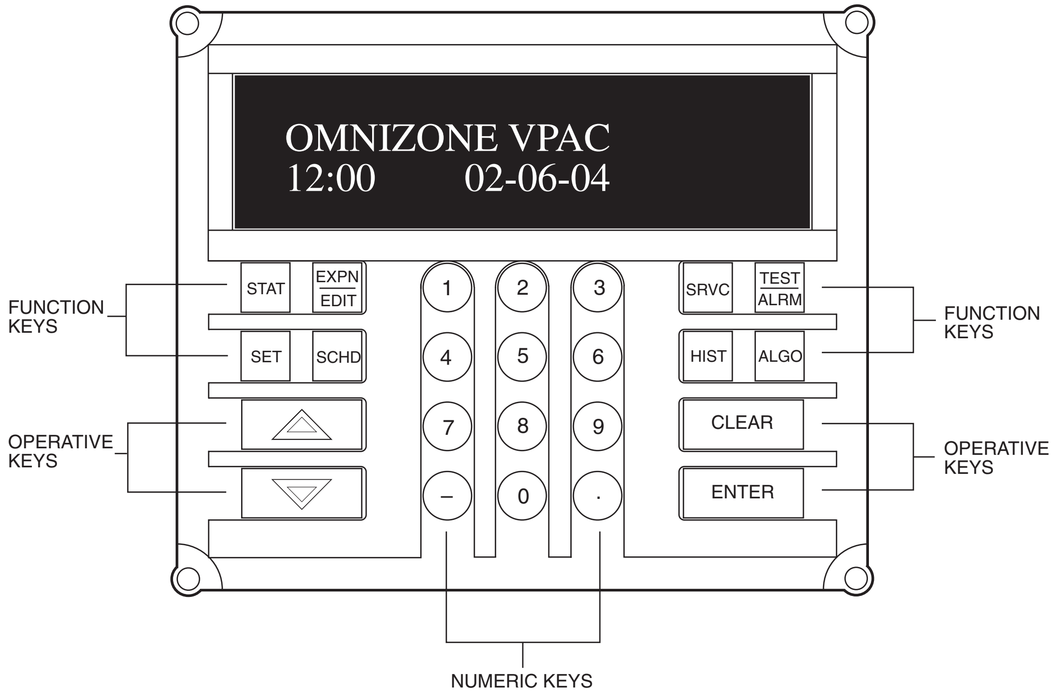



**Fig. 32 — LID**

23. The control forces CMP2 (compressor 2) on then waits 5 seconds.

    If CSMUX is not in range, the red LED will go on and the test will stop.

    If CSMUX is in range, the red LED blinks once and the test continues.
24. The control forces CMP2 off.
25. The control forces CMP3 (compressor 3) on, if configured, then waits 5 seconds.

    If CSMUX is not in range, the red LED will go on and the test will stop.

    If CSMUX is in range, the red LED blinks once and the test continues.
26. The control forces CMP3 off.
27. The control forces CMP4 (compressor 4) on, if configured, then waits 5 seconds.

    The LID display shows:

    Factory/Field Test

    Stop

    Both the yellow and red LEDs will go off.
28. The control forces CMP4 off.
29. The run test is complete.

CHECK VFD — The VFD is factory wired and programmed for proper operation with the unit controls; no installation or service adjustments are normally required. At unit start-up, the VFD's LED will display "0.0 Hz." Refer to Fig. 33.

POWER UP LID DISPLAY — After completing the automatic run test, perform the following procedures to change the controller password, set the controller clock, configure schedules, set parameters, view settings, and view alarm history.

1. Set the Remote/Local/Off switch on the front of the unit to the OFF position. This prevents operation of the fan and compressors while still providing power to the unit controls.

   NOTE: When the switch is in the OFF position, the red alarm LED will be lit; this is normal.
2. If the unit access panel (for power and controls) is still on the unit, remove it in order to view the control modules during start-up.
3. Switch the main unit power disconnect to ON.

When power is applied to the Omnizone™ system control panel, the red LED on the top front of the processor module will flash at a rapid pace (about twice a second) for the first 30 to 60 seconds. This rapid flash will then be replaced by a slower pace of about once per second.

The green LED below the red LED will start flashing. The green LED indicates input/output communications for accessory input output modules and the LID display.

The yellow LED will flash when the controller is broadcasting CCN messages to a laptop or other computer.

The third LED from the bottom of the controller (PCB1) will light.

The LID display will show the controller identification, time and date as shown below.

OMNIZONE VPAC

hh:mm mm-dd-yy

LOG ON TO THE LID DISPLAY — To log on to the LID display, perform the following procedure:

1. Press 3 and then SET. The LID display will show:

   Controller Password
2. Press ENTER. The LID display will show:

   Log in to Controller

   Enter Password

   NOTE: The LID display has two modes: Edit mode and Status/Maintenance mode. Edit mode allows the user to change settings on the configurations screens. Status/Maintenance mode only allows the user to look at the settings.

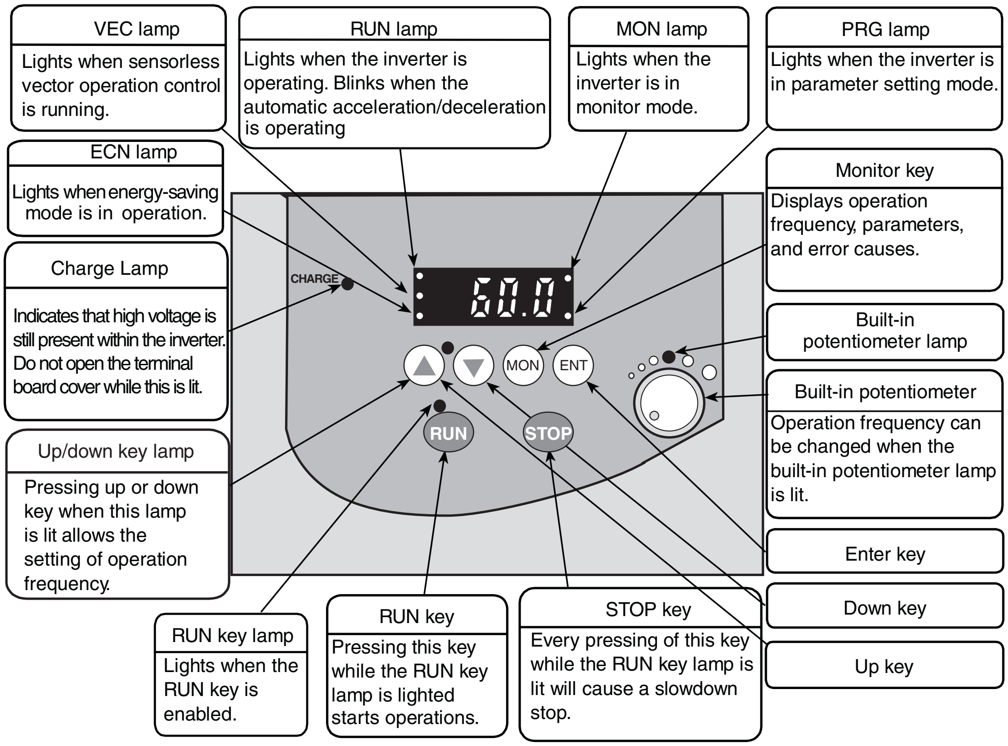



**Fig. 33 — 50BV VFD Display**

If the LID display is in Edit mode, then the display will only show the word "password." Press the EXPN/EDIT key to toggle to the Status mode. Make sure the LID display shows:

Log in to Controller
Enter Password

3. Key in the password and press ENTER.
   NOTE: The default password is 1111.
4. The LID display will show:
   Log in to Controller
   Logged In
   NOTE: The user will be automatically logged off after 15 minutes of non-use.

CHANGE THE DEFAULT PASSWORD — To change the default password, perform the following procedure:

NOTE: The password must have already been entered to perform this procedure.

1. Press 3 and then SET. The LID display will show:
   Controller Password
2. Press ENTER . The LID display will show:
   Log in to Controller
   Logged in
3. Press EXPN/EDIT . The LID display will show:
   Password
   1111 (default password, or previous password entered)
4. Enter the new password (up to 6 digits) and press ENTER . The LID display will show:
   Password
   (password just entered)
   NOTE: Remember this password; write it down.
5. Press CLEAR twice to leave the password screen and return to the default display screen.

SET THE CLOCK — The user must be logged in to set the clock. To set the clock, perform the following procedure:

1. Press 1 and then SET . The LID display will show:
   Set Clock
2. Press ENTER . The LID display will show:
   No Maintenance
   NOTE: There is no maintenance information regarding setting the clock.
3. Press EXPN/EDIT . The LID display will show:
   Time
   00:00
4. Enter the time. The time is entered in military time (for example 14.59 for 2.59 pm). Press ENTER then press the ▼ button. The LID display will show:
   Day of Week
   1
5. Enter the day of week. The numbers 1 through 7 correspond to the days of the week (1 = MON, 2 = TUE, 3 = WED, 4 = THUR, 5 = FRI, 6 = SAT, 7 = SUN). Press ENTER then press ▼ . The LID display will show:
   Month
   1
6. Enter the number of the corresponding month (1 through 12). Press ENTER then press ▼ . The LID display will show:
   Day
   1

7. Enter the day of the month. Press [ENTER] then press [▼]. The LID display will show:

   Year

   95
8. Enter the last two digits of the current year. Press [ENTER] then press [▼]. The LID display will show:

   Update Clock

   No
9. Press 1 and then [ENTER] to update the clock. The LID display will flash. Press [CLEAR] twice to view the default display and the clock should update to the input time and date.

CONFIGURE SCHEDULES — Schedules are one method of starting and stopping the unit at specified intervals. To configure the schedules, perform the following procedure:

1. Press 1 and then [SCHD]. The LID display will show:

   Occupancy Algorithm
2. Press [ENTER]. The LID display will show:

   Time Schedule

   Enter to Select
3. Press [ENTER]. If the LID display shows "MODE 0," then the user is in Maintenance mode and the LID display is showing the maintenance information for the occupancy schedule. Press [EXPN/EDIT] to enter the configuration mode. The LID display will show:

   Manual Override Hours

   0 hours

   This is the first configuration for each occupancy algorithm and is used to put the schedule in or out of occupancy override for the number of hours entered.
4. Press [▼]. The LID display will show:

   Period 1: Day of week

   00000000

   The eight digits represent the certain days of the week or holidays this period should apply to: M, Tu, W, Th, F, Sa, Su, and Hol, respectively. Enter a series of 0s or 1s with a 1 corresponding to the days that this period should apply to and a 0 for the days that this schedule should not apply to. As an example, entering 11111000 would make the schedule apply to days Monday through Friday and not apply to Saturday, Sunday, or Holidays.
5. Press the [▼] button. The LID display will show:

   Period 1 occupied from

   00:00
6. Input the occupancy start time for this period.

   NOTE: 12.00 represents 12:00 pm.
7. Press the [▼] to input the occupied to time for period 1.
8. Input the days and times for periods 2 through 8 as required.
9. Press [CLEAR] to leave the occupancy programming.

PROGRAM SET POINTS — To program the set points, perform the following procedure:

1. Press 2 and then [SCHD]. The LID display will show:

   Setpoint Schedule
2. Press [ENTER]. The LID display will show:

   Supply Fan Status

   SETPT01
3. Press [ENTER].
4. If "No Maintenance" is displayed, press [EXPN/EDIT] to view the set point information. The LID display will show:

   Occupied Lo Setpoint

   0.30 in. H2O

   This is the pressure set point below which the fan is considered to be off.
5. Press [▼]. The LID display will show:

   Occupied Hi Setpoint

   0.40 in. H2O

   This is the pressure set point above which the fan is considered to be on.

   The down or up arrow will also display the unoccupied low and high temperature set points. These values should be kept the same as the occupied values.
6. To view set points 02-09, use the following sequence:

   Press 2 and then [SCHD]. The LID display will show:

   Setpoint Schedule

   Press [ENTER]. The LID display will show:

   Supply Fan Status

   SETPT01

   Press [▼] to scroll down to the desired set point. Press [ENTER] to select.

   To view another point, press [CLEAR] once to move up one menu level. Then press [▼] to scroll down to the desired set point and press [ENTER] to select.
7. Pressing the [CLEAR] button will take the user out of the set point configuration mode.

   Set point functions are as follows:

   Setpoint 02 (VAVRESETbaseline) internally coordinates the supply air set point reset in several of the algorithms and cannot be modified.

   Setpoint 03 (Heat/Cool Mode & Reset) is used for comparison by the unit to return air, space temperature, or average space temperature through linkage to determine when to start reset of the supply air when occupied, when to turn on heat and disable cooling when occupied, and when to bring the unit on for unoccupied heating or cooling.

   Setpoint 05 (Supply Static Pressure) is used to set the supply air static pressure the unit should maintain. Only the Occupied Low set point may be modified. The other values will change to the Occupied Low value shortly after it is modified so that all the values remain the same. The set point in the static pressure control algorithm will also follow and cannot be modified in the algorithm configuration screens.

   Setpoint 06 (Supply Air Temperature) is the supply air temperature set point. Only the Occupied Low set point may be modified. The other values will change to the Occupied Low value shortly after it is modified so that all the values remain the same. The set point in DX VAV staging and some of the other algorithms will also follow and cannot be modified in the algorithm configuration screens.

   Table 21 lists the available controller set points and their default values. Refer to 50BV,XJ Controls, Operation and Troubleshooting manual for additional set point descriptions.

## Table 21 — Controller Set Points

| DESCRIPTION DISPLAY SCREENS | VALUE | UNITS | STATUS | FORCE | NAME |
|---|---|---|---|---|---|
| **OMNIZONE:SETPT01:** | | | | | |
| **Supply fan Status** | | | | | |
| **Occupied Lo Setpoint** | 0.3 | in. H2O | | | OccLow |
| **Occupied Hi Setpoint** | 0.4 | in. H2O | | | OccHgh |
| **Unoccupied Lo Setpoint** | 0.3 | in. H2O | | | UnOccLow |
| **Unoccupied Hi Setpoint** | 0.4 | in. H2O | | | UnOccHgh |
| **OMNIZONE:SETPT02:** | | | | | |
| **VAVRESETbaseline** | | | | | |
| **Occupied Lo Setpoint** | 0 | dF | | | OccLow |
| **Occupied Hi Setpoint** | 0 | dF | | | OccHgh |
| **Unoccupied Lo Setpoint** | 0 | dF | | | UnOccLow |
| **Unoccupied Hi Setpoint** | 0 | dF | | | UnOccHgh |
| **OMNIZONE:SETPT03:** | | | | | |
| **Heat/Cool Mode & Reset** | | | | | |
| **Occupied Lo Setpoint** | 70 | dF | | | OccLow |
| **Occupied Hi Setpoint** | 74 | dF | | | OccHgh |
| **Unoccupied Lo Setpoint** | 55 | dF | | | UnOccLow |
| **Unoccupied Hi Setpoint** | 85 | dF | | | UnOccHgh |
| **OMNIZONE:SETPT04:** | | | | | |
| **Head Pressure Control** | | | | | |
| **Occupied Lo Setpoint** | 225 | PSIG | | | OccLow |
| **Occupied Hi Setpoint** | 225 | PSIG | | | OccHgh |
| **Unoccupied Lo Setpoint** | 225 | PSIG | | | UnOccLow |
| **Unoccupied Hi Setpoint** | 225 | PSIG | | | UnOccHgh |
| **OMNIZONE:SETPT05:** | | | | | |
| **Supply Static Pressure** | | | | | |
| **Occupied Lo Setpoint** | 1.5 | in. H2O | | | OccLow |
| **Occupied Hi Setpoint** | 1.5 | in. H2O | | | OccHgh |
| **Unoccupied Lo Setpoint** | 1.5 | in. H2O | | | UnOccLow |
| **Unoccupied Hi Setpoint** | 1.5 | in. H2O | | | UnOccHgh |
| **OMNIZONE:SETPT06:** | | | | | |
| **Supply Air Temperature** | | | | | |
| **Occupied Lo Setpoint** | 55 | dF | | | OccLow |
| **Occupied Hi Setpoint** | 55 | dF | | | OccHgh |
| **Unoccupied Lo Setpoint** | 55 | dF | | | UnOccLow |
| **Unoccupied Hi Setpoint** | 55 | dF | | | UnOccHgh |
| **OMNIZONE:SETPT07:** | | | | | |
| **Building Static Pressure** | | | | | |
| **Occupied Lo Setpoint** | 0.02 | in. H2O | | | OccLow |
| **Occupied Hi Setpoint** | 0.02 | in. H2O | | | OccHgh |
| **Unoccupied Lo Setpoint** | 0.02 | in. H2O | | | UnOccLow |
| **Unoccupied Hi Setpoint** | 0.02 | in. H2O | | | UnOccHgh |
| **OMNIZONE:SETPT08:** | | | | | |
| **BSP raw control** | | | | | |
| **Occupied Lo Setpoint** | 12.32 | ma | | | OccLow |
| **Occupied Hi Setpoint** | 12.32 | ma | | | OccHgh |
| **Unoccupied Lo Setpoint** | 12.32 | ma | | | UnOccLow |
| **Unoccupied Hi Setpoint** | 12.32 | ma | | | UnOccHgh |
| **OMNIZONE:SETPT09:** | | | | | |
| **Humidity Control** | | | | | |
| **Occupied Lo Setpoint** | 0 | %RH | | | OccLow |
| **Occupied Hi Setpoint** | 99 | %RH | | | OccHgh |
| **Unoccupied Lo Setpoint** | 0 | %RH | | | UnOccLow |
| **Unoccupied Hi Setpoint** | 99 | %RH | | | UnOccHgh |

CHECK SYSTEM PARAMETERS — To check system parameters, press the [STAT] button. The LID display will show: “Hardware Points”. Press [ENTER] to view the hardware points. The user can navigate up and down through the points with the ▲ and ▼ keys.

Press 2 and [STAT] to display the software points. The user can navigate up and down through the points with the ▲ and ▼ keys.

Refer to Tables 22 and 23 for hardware and software points.

## Table 22 — Controller Hardware Points

| DESCRIPTION DISPLAY SCREENS | VALUE | UNITS | STATUS | FORCE | NAME |
|---|---|---|---|---|---|
| **OMNIZONE:HWP01-32:** | | | | | |
| **Hardware points Table 1** | | | | | |
| **Supply Air Temperature** | 67 | dF | | | SAT |
| **Duct Static Pressure** | 0.2 | in. H2O | | | DSP |
| **Comp. Status MUX** | 1.86 | Volts | | | CSMUX |
| **Fire Alarm/ShutDown** | Enable | | | | FSD |
| **Cond. Water Flow Switch** | Yes | | | | CDWF |
| **Remote Occupancy** | Disable | | | | ROCC |
| **Duct High Press. Switch** | Normal | | | | DHS |
| **Entering Water Temp.** | 69.9 | dF | | | EWT |
| **Compressor 1 Relay** | Stop | | | | CMP1 |
| **Compressor 2 Relay** | Stop | | | | CMP2 |
| **Compressor 3 Relay** | Stop | | | | CMP3 |
| **Compressor 4 Relay** | Stop | | | | CMP4 |
| **Supply Fan/VFD** | Stop | | | | SF |
| **VFD Speed Signal** | 0 | % | | | SPEED |
| **Non Critical Fault** | Off | | | | WARN |
| **Critical Fault** | Off | | | | ALARM |
| **Mixed/Return Air Temp** | 77.2 | dF | | | MA_RA |
| **Dirty Filter Status** | Clean | | | | FLTS |
| **Phase Loss Protection** | Normal | | | | PHASE |
| **Ext. Supply Air Reset** | 0 | dF | | | RESET |
| **Water Econ. FreezeStat** | Normal | | | | FREEZ |
| **Space_Reset Sensor** | 79.2 | dF | | | SPT |
| **VFD Bypass Enable** | Disable | | | | BYPAS |
| **Head Pressure(Comp1)** | 118.76 | PSIG | | | PRES |
| **Ventilation Request** | Close | | | | VENTR |
| **VAV Terminals Control** | No | | | | TRMCT |
| **2-position/Econo Valve** | 0 | % | | | ECONO |
| **Reverse/Head Press Ctrl** | 100 | % | | Control | MVLV |
| **Hot Water Valve** | 0 | % | | | HWV |
| **Heat Interlock Relay** | Off | | | | HIR |
| **Bypass Start_Stop** | Stop | | | | BPS_S |
| **VAV Terminals Open MAX** | Close | | | | TRMOP |
| **OMNIZONE:HWP33-64:** | | | | | |
| **Hardware points table 2** | | | | | |
| **Cooling Tower Sump Temp.** | 57.5 | dF | | | TWR |
| **Building Static Milliamp** | 12.51 | ma | | | BSP |
| **Condenser Leaving Water** | 70.3 | dF | | | LWT |
| **Indoor Air Quality** | 587.21 | | | | IAQ |
| **Indoor Relative Humidity** | 49.7 | % | | | IRH |
| **Outdoor Air Temp.** | 76.1 | dF | | | OAT |
| **Heat Stage 1** | Off | | | | HEAT1 |
| **Heat Stage 2** | Off | | | | HEAT2 |
| **Heat Stage 3** | Off | | | | HEAT3 |
| **Heat Stage 4** | Off | | | | HEAT4 |
| **Pump Request** | Off | | | | PUMP |
| **Cooling Tower Request** | Off | | | | TOWER |
| **Exhaust Fan** | 0 | % | | | EXH |
| **Ext. Dehumidification** | Stop | | | | DEHUM |

## Table 23 — Software Points

| DESCRIPTION DISPLAY SCREENS | VALUE | UNITS | STATUS | FORCE | NAME |
|---|---|---|---|---|---|
| **OMNIZONE:SWP65-96:** | | | | | |
| **Software Points** | | | | | |
| **Compressor 1 Status** | Off | | | | CLO1 |
| **Compressor 2 Status** | Off | | | | CLO2 |
| **Compressor 3 Status** | Off | | | | CLO3 |
| **Compressor 4 Status** | Off | | | | CLO4 |
| **Bypass Acc Panel Secure** | No | | | | BP_SAFE |
| **DX VAVRESET control** | 0 | dF | | | VAVRESET |
| **Factory/Field Test** | Stop | | | | FLDTST |
| **Building Static Pressure** | 0.03 | in. H2O | | | BSP_IN |
| **Time Clock** | Off | | | | TIMCLOCK |
| **Cooling** | Disable | | | | COOLOK |
| **Supply Fan Status** | Off | | | Control | SFS |
| **Ok to run Fan** | No | | | | OKFAN |
| **OK Fan + Sup. Fan Stat** | FALSE | | | | SF_SFS |
| **Fan + Cond. Water Flow** | FALSE | | | | FAN_CDWF |
| **Equipment Mode** | Cool | | | Control | MODE |
| **Activate Evacuation Mode** | Disable | | | | EVAC |
| **Space Control Point** | 74 | dF | | | CTRLPT |
| **Mod. Econ Enabled** | No | | | Control | ECON_OK |
| **Head Pressure Control** | Disable | | | Control | HEAD |
| **Economizer Control Temp.** | 77.22 | dF | | | ECONPT |
| **Compressor Cooling** | Disable | | | | COMPRES |
| **Duct Static Failure** | Normal | | | | DSP_ALM |
| **Compressor 1 Alarm** | Normal | | | | C1_ALM |
| **Compressor 2 Alarm** | Normal | | | | C2_ALM |
| **Compressor 3 Alarm** | Normal | | | | C3_ALM |
| **Compressor 4 Alarm** | Normal | | | | C4_ALM |
| **Cond. Flow Alarm Status** | Disable | | | Control | CDWF_ST |

DISPLAY ALARM HISTORY — If the controller is indicating there are alarms, the user can view the alarm history by pressing the HIST button. The LID display will show “Alarm History.” Press ENTER . The LID display will show the date and type of alarm.

As an example, if the LID display shows:

ALARM — 10:55 02-11-04

SFS

That display indicates that on 02-11-04 at 10:55 a.m. the supply fan was either on when it had not been commanded on or was off when it was commanded on.

The user can view other stored alarms by pressing the up and down arrows. The twenty-four most recent alarms are stored.

CONFIGURE CUSTOM PROGRAMMING SELECTIONS — To configure the custom programming selections, perform the following procedure:

1. Press 37 ALGO . The LID display will show:
   Custom Program
2. Press ENTER . The LID display will show:
   2.0 Global Dictionary
   OMNIZONE
3. Press ENTER . The display indicates “No Data.” Press CLEAR then press EXPN/EDIT . Press ENTER again. The LID display should now show:
   Compressor Stages
   2.00 (sizes 020-034)
   4.00 (sizes 044-064)
4. Press ▼ 7 times. The display will show:
   0 = RAT, 1 = MAT 2 = NONE
   0.00
5. Press 2 then ENTER . The display will show:
   0 = RAT, 1 = MAT 2 = NONE
   2.00
6. If RAS is installed at EWT input, press ▲ 3 times. The display will show:
   EWT Reset 0 = NO, 1 = YES
   0.00
7. Press 1 then ENTER . The display will now show:
   EWT Reset 0 - NO, 1 = YES
   1.00
8. Use the down and up arrows to select the other configuration parameters as required. See Table 24 for a list of configuration parameters.

**Table 24 — Configuration Parameters**

| DESCRIPTION | VALUE | UNITS | NAME |
|---|---|---|---|
| **Compressor Stages** | 2.00 | | NUM_CMP |
| **Reset Ratio** | 3.00 | dF | RSET_RTO |
| **CDWF 0=NO,1=YES** | 0.00 | | CDFW_SWT |
| ***ECON 0=NO,1=YES** | 0.00 | | EWT_SNS |
| **EWT Reset 0=NO,1=YES** | 0.00 | | EWT_RST |
| ***MOD.VLV 0=NO,1=YES** | 0.00 | | MOD_ECON |
| ***0=CONST.,1=VARIABLE** | 0.00 | | FLOW_TYP |
| **0=RAT,1=MAT 2=NONE** | 2.00 | | MARA_SNS |
| **PHASE 0=NO,1=YES** | 0.00 | | PHAS_SWT |
| ***FREEZ 0=NO,1=YES** | 0.00 | | FREZ_SWT |
| ***ENABLE ECON.** | 68.00 | dF | ECON_SET |
| **SPT 0=NO,1=YES** | 0.00 | | SPT_SNS |
| **PRES 0=NO,1=YES** | 0.00 | | PRES_SNS |
| **TWR 0=NO,1=YES** | 0.00 | | TWR_SNS |
| **LWT 0=NO,1=YES** | 0.00 | | LWT_SNS |
| **IAQ 0=NO,1=YES** | 0.00 | | IAQ_SNS |
| **IRH 0=NO,1=YES** | 0.00 | | IRH_SNS |
| **BSP 0=NO,1=YES** | 0.00 | | BSP_SNS |
| **BSP Range** | 1.00 | in. H2O | BSP_RNG |
| **BSP LOW VALUE** | –0.50 | in. H2O | BSP_LOW |

*Not used.

SET CONTROLLER ADDRESS — To set the address of the Omnizone™ system control panel controller, perform the following procedure:

1. Press 7 and then SRVC . Press ENTER and then EXPN/EDIT .
2. Type in the CCN element number and press ENTER .
3. Press the ▼ button. Type in the CCN bus number and press ENTER .

LOG OFF FROM CONTROLLER — To log off from the OMNIZONE system control panel controller Press 3 and then SET . The controller password will be displayed.

1. Press ENTER . The display should show:
   Log in to Controller
   Logged in
   If this is not displayed, Press EXPN/EDIT until it is displayed.
2. Press the ▼ button. The LID display will show:
   Log out of Controller
   Press 1. Press ENTER to log off.

**Sequence of Operation (CV Only) —** The following sequence applies to constant volume units only.

Cooling is initiated when the set point in the remote thermostat is not met (space temperature is higher than set point). The unit sequence of operation is as follows:

The 50BV units can be remotely authorized to be controlled by the thermostat through the optional energy management system relay (EMS). The coil is powered by the energy management (building automation) system whose contacts are in series with the ‘R’ 24-v ac terminal with potential across ‘C’ (transformer common). With this terminal open, power will be interrupted to the thermostat. Closure of this contact will allow the 50BV unit to operate from the thermostat.

Contact closure at the ‘G’ terminal will provide power to the supply fan contactor, energizing the supply fan. The supply fan will be off during unoccupied schedule, depending upon the features of the thermostat used. The ‘O’ terminal energizes the reversing valve (heat pump units only). Typically ‘Y1’ will also be energized at this time for cooling operation. During the second stage of cooling, ‘Y2’ will be initialized after a minimum run time and after there is a differential from set point plus a deadband or a proportional plus integral calculation, which is based upon demand and the length of time space-temperature is greater than set point. Additional assurance is provided by a delay on make timer in the second stage compressor contactor circuit to avoid dual compressor in-rush starting current.

For 4 compressor units, a call for the first stage of cooling will turn on compressors 1 and 2. The second stage of cooling will turn on compressors 3 and 4.

Heating mode (heat pump models only) follows the same sequence as above except that the reversing valve is not energized.

WATER ECONOMIZER COOLING — The unit diverts condenser inlet waterflow through an optional economizer coil to precool evaporator entering airflow. If the entering water temperature is colder than the setting on the aquastat, and the return-air temperature is warmer than the setting on the return-air thermostat, the 3-way diverting valve will direct water to the economizer coil.

Economizer water flow is in series with the condensers allowing compressor operation while the economizer is operating.

**Sequence of Operation (VAV Only) —** The following control sequence of operation for the VAV units describes the various sequences that occur depending upon the way an operation is triggered and which software control points are involved.

SUPPLY FAN — The supply fan can be activated in any of the following ways:

- Unoccupied space or return air temperature demand
- Unoccupied linkage demand
- Local time schedule (TIMCLOCK software point)
- Remote occupancy (ROCC software point)
- Remote-off-local switch in the local mode
- Enabled by schedule

Once one of the above conditions exists, either TIMECLOCK or ROCC indicates ON or enable. The software point OKFAN will turn on followed by the points TRMCT for air terminal control and PUMP and TOWER to request condenser water flow and temperature control. Approximately 20 to 30 seconds later, the supply fan (SF) point will turn ON and the VFD output SPEED will increase. The SPEED point will output a signal, determined by a PID (proportional integral derivative loop) calculation, based on the duct static pressure (DSP) input and the supply static pressure setpoint in SETPT05.

Once the supply fan is running and the static pressure increases above the supply fan status setpoint in SETPT01, the supply fan status point (SFS) will indicate ON and the software point SF_SFS will indicate TRUE.

Enabled By Unoccupied Demand — A software point "space control point" will display the current value of the sensor used to determine unoccupied demand. The EWT sensor provides this function for the 50BV unit. The display is based on the sensors installed and the configuration of these sensors in the custom configuration, or the status of linkage.

If there is no RAS connected to the EWT input, the space control point will display a default value of 75 F. This value is above the default occupied cooling set point and below the unoccupied cooling set point. If this condition exists, supply air reset from a sensor and unoccupied unit operation will not occur.

If the unit is configured to use an RAS sensor for the Space Control Point or if linkage is active and the space has unoccupied demand, the software point OKFAN will turn on followed by the software points TRMCT for air terminal control and PUMP and TOWER to request condenser water flow and temperature control. Approximately 20 to 30 seconds later the SF point will turn ON and then the VFD output SPEED will increase. If unoccupied demand is the reason the fan is on, a control force will appear next to the OKFAN point. Otherwise, there should not be a force on that point.

If the fan is running due to unoccupied heating or cooling demand, either the space temperature (if installed), return-air temperature, or average linkage temperature must rise or drop to within half way between the occupied and unoccupied set points in order for the fan to turn back off.

Enabled by Switching to Local Mode — When the switch is placed in the Local mode the ROCC point will indicate enable. If ROCC is ENABLED a software routine will override the occupancy schedule so that TIMECLOCK will also turn on. When ROCC is turned off the TIMECLOCK point will turn off within 60 seconds.

Supply Fan Shutdown — If the unoccupied demand is satisfied and TIMECLOCK and ROCC are off and disabled, OKFAN will turn off, SF_SFS will turn off, Tower and PUMP will turn off, and then 5 minutes later the SF point will turn off and the VFD speed will go to 0%.

During the 5-minute delay, the cooling and heating routines become disabled. This delay allows a compressor that may have just started to run for its 5-minute minimum on time with the supply fan on. For example, if the staging routine had just started Compressor 3 at the time the OKFAN point changed to OFF, the cooling routine would become disabled and compressors 1 and 2 would shut off right away. Compressor three would continue to run for its minimum on time of 5 minutes. The fan continues running until all compressors meet the minimum on time and run with a load, preventing them from shutting down due to a safety.

COMPRESSOR COOLING — If the fan is on and there is no demand for heat, the Equipment mode (MODE) will be COOL, and Cooling (COOLOK) will switch to ENABLE.

COMRES triggers the compressor staging routine that controls the number of compressors energized. Units are equipped with 2 or 4 compressors piped in separate refrigerant circuits, and staged On/Off in a fixed sequential manner (compressor no. 1 through compressor no. 4). The compressor control routine uses a PID calculation to determine the percentage of cooling required, from 1 to 100%. Demand for the PID calculation is determined from the supply air temperature and the supply air setpoint (SETPT06).

Compressor cooling (COMPRES) will be turned off for any of the following reasons:

- There is no condenser water flow (CDWF is Off).
- MODE changes to heat.
- OKFAN turns off during normal shut down.

During normal compressor operation the minimum on time is 5 minutes and the minimum off time is 5 minutes.

WATER ECONOMIZER COOLING — The unit diverts condenser inlet waterflow through an optional economizer coil to precool evaporator entering airflow. If the entering water temperature is colder than the setting on the aquastat, and the return-air temperature is warmer than the setting on the return-air thermostat, the three-way diverting valve will direct water to the economizer coil.

Economizer water flow is in series with the condensers, allowing compressor operation while the economizer is operating.

NOTE: The return-air thermostat (RAT) is separate from the RAS sensor.

COOLING RESET — The 5 kiloohm temperature sensor will be used as the space control point. If this variable goes below the occupied high set point in the HEAT/COOL MODE AND RESET set point (SETPT03), then for each degree that the space control point is below the set point value, the supply air set point will be reset by the value configured in the custom configuration RESET RATIO.

**Diagnostic Features (CV Only) —** The main control board (MCB) in the constant volume units has 2 LEDs that provide diagnostic information. Refer to the Troubleshooting section for a detailed description of the LED codes.

**VAV Control and VFD Diagnostics —** Refer to the 50BV,XJ Controls Operation and Troubleshooting manual for detailed information about diagnosing and correcting control and VFD messages.

## SERVICE

> ⚠ **CAUTION**
>
> **Improper phase sequence will cause scroll compressor failure due to reverse rotation.**
>
> Signs of miswire are:
> - Excessive noise
> - Reverse rotation of 3 phase indoor fan
> - Rapid temperature rise on suction tube
> - No pressure differential
>
> Correct immediately. Shut off power at disconnect and switch any 2 power leads at unit terminal block or pigtails.

**Compressor Rotation —** To determine whether or not the compressor is rotating in the proper direction:

1. Connect service gages to suction and discharge pressure fittings.
2. Energize the compressor.

   The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up. If the suction pressure does not drop and the discharge pressure does not rise to normal levels:
3. Turn off power to the unit and tag disconnect.
4. Reverse any 2 of the unit power leads.

   Reapply power to the unit. The suction and discharge pressure levels should now move to their normal start-up levels.

   Also, check that the fan is rotating in the proper direction.

NOTE: When the compressor is rotating in the wrong direction, the unit makes an elevated level of noise and does not provide cooling.

**Fan Motor Replacement —** If required, replace the fan motor with an equal or better type and efficiency motor with equal horsepower. The motor must be rated for a VFD or inverter application. Do not change the horsepower unless there is a system design requirement change and VFD size analysis.

CHECK/CHANGE VFD OUTPUT CURRENT LIMIT — The VFD provides additional fan motor protection by limiting the output current to a programmed value. This value has been factory set according to the factory-installed motor and VFD sizing options.

If the VFD and/or motor is replaced, the VFD setup mode parameter "tHr1" should be reprogrammed to the following calculated values for optimum motor protection and operating range:

For VFD size about equal to motor:

tHr1 = 100*motor nameplate Amps / VFD rated output Amps

## MAINTENANCE

**Cleaning Unit Exterior —** Unit exterior panels should be wiped down using a damp soft cloth or sponge with a mixture of warm water and a mild detergent.

**Coil Cleaning —** Hot water, steam, and direct expansion coils must be cleaned at least once a year to maintain peak performance. Dirty coils can contribute to decreased heating or cooling capacity and efficiency, increased operating costs, and compressor problems on direct expansion systems. Dirt, grease, and other oils can also reduce the wettability of the coil surfaces, which can result in moisture blow-off from cooling coils and resulting water leakage problems. If the grime on the surface of the coils becomes wet, which commonly occurs with cooling coils, microbial growth (mold) can result, causing foul odors and health related indoor air quality problems.

Coils can become dirty over a period of time, especially if air filter maintenance is neglected. Coils should be inspected regularly and cleaned when necessary. Clean coils with a vacuum cleaner, fresh water, compressed air, or a bristle brush (not wire). Do **not** use high-pressure water or air. Damage to fins may result. Backflush coil to remove debris. Commercial coil cleaners may also be used to help remove grease and dirt. Steam cleaning is NOT recommended. After cleaning, use a fin comb of the correct fin spacing when straightening mashed or bent coil fins.

Units installed in corrosive environments should be cleaned as part of a planned maintenance schedule. In this type of application, all accumulations of dirt should be cleaned off the coil.

**Inspection —** Check coil baffles for tight fit to prevent air from bypassing the coil. Check panels for air leakage, particularly those sealing the fan and coil compartments. Check for loose electrical connections, compressor oil levels, proper refrigerant charge, and refrigerant piping leaks. Before start-up, be sure all optional service valves are open.

**Air Filters —** The 50BV single-piece units come with 1-in. filters. The standard 1-in. filters provide lower pressure drop and longer filter service intervals. The 50BV modular units come with 4-in. filters.

Inspect air filters every 30 days and replace filters as necessary.

Replacement filters should have a minimum efficiency rating of MERV 6 per ASHRAE rating procedures and be rated for up to 625 fpm velocity. Job requirements or local codes may specify higher minimum ratings.

**Condensate Drains —** Clean the drain line and unit drain pan at the start of each cooling season. Check flow by pouring water into the drain.

**Water-Cooled Condensers —** Water-cooled condensers may require cleaning of the scale (water deposits) due to improperly maintained closed-loop water systems. Sludge build-up may need to be cleaned in an open tower system due to inducted contaminants.

Local water conditions may cause excessive fouling or pitting of tubes. Condenser tubes should be cleaned at least once a year, or more often if the water is contaminated.

Proper water treatment can minimize tube fouling and pitting. If such conditions are anticipated, water treatment analysis is recommended. Refer to the System Design Manual, Part 5, for general water conditioning information.

> ⚠ **CAUTION**
>
> Follow all safety codes. Wear safety glasses and rubber gloves when using inhibited hydrochloric acid solution. Observe and follow acid manufacturer's instructions.

Isolate the supply and return water connections when removing piping to the condenser.

Clean condensers with an inhibited hydrochloric acid solution. The acid can stain hands and clothing, attack concrete, and, without inhibitor, can attack steel. Cover surroundings to guard against splashing. Vapors from vent pipe are not harmful, but take care to prevent liquid from being carried over by the gases.

Warm solution acts faster, but cold solution is just as effective if applied for a longer period.

GRAVITY FLOW METHOD (Fig. 34) — Do not add solution faster than the vent can exhaust the generated gases.

When condenser is full, allow the solution to remain overnight then drain the condenser and flush with clean water. Follow acid manufacturer's instructions.

FORCED CIRCULATION METHOD (Fig. 35) — Fully open the vent pipe when filling the condenser. The vent may be closed when the condenser is full and the pump is operating.

Regulate the flow to the condenser with a supply line valve. If the pump is the non-overloading type, the valve may be fully closed while the pump is running.

For average scale deposit, allow the solution to remain in the condenser overnight. For heavy scale deposit, allow a full 24 hours. Drain the condenser and flush with clean water. Follow acid manufacturer's instructions.

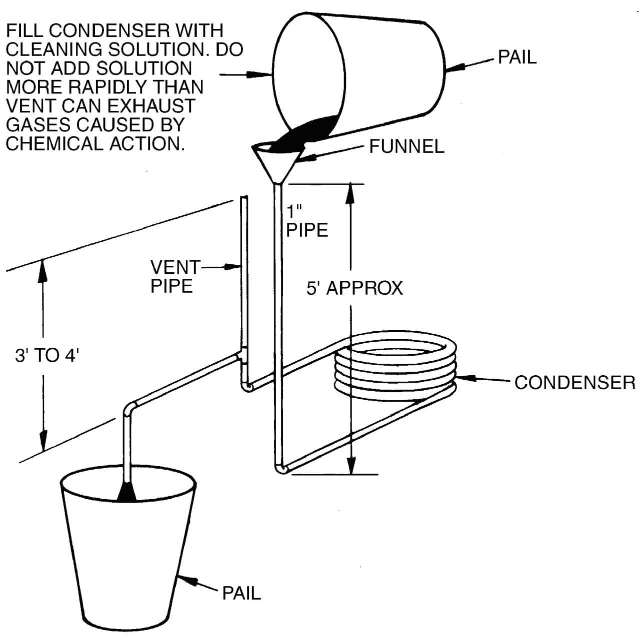



**Fig. 34 — Gravity Flow Method**

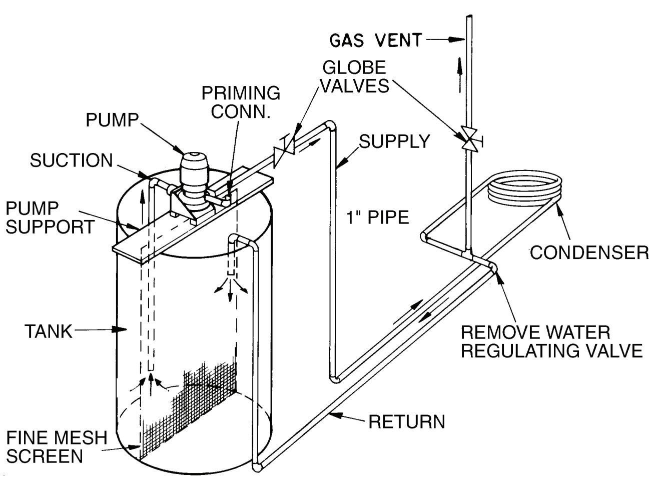



**Fig. 35 — Forced Circulation Method**

**Fan Motor Lubrication —** The fan motor was properly lubricated at the time of manufacture. Lubricate the fan motor(s) with SAE-20 non-detergent electric oil.

| |
|---|
| IMPORTANT: PILLOW BLOCK STYLE FAN BEARINGS: Bearings have been prelubricated with high quality grease. Bearings must be relubricated once every 6 months or every 2500 hours of operation whichever comes first. |

**Fan Bearing Lubrication —** Inspect the fan bearings for proper lubrication every 6 month or 2500 hours of operation, whichever comes first. Standard units have grease fittings on the fan shaft bearings, located on each side of the blower wheel. Lubricate bearings with a lithium-based grease (NLGI Grade 2).

**Fan Sheaves —** Factory-supplied drives are pre-aligned and tensioned, however, it is recommended that the belt tension and alignment be checked before starting the unit. Always check the drive alignment after adjusting belt tension.

To install sheaves on the fan or motor shaft:

1. Isolate power to the unit.
2. Remove side unit access panel(s).
3. Remove any rust-preventive coating on the fan shaft.
4. Make sure the shaft is clean and free of burrs. Add grease or lubricant to bore of sheave before installing.
5. Mount sheave on the shaft; to prevent bearing damage, do not use excessive force.

Each factory-assembled fan, shaft, and drive sheave assembly is precision aligned and balanced. If excessive unit vibration occurs after field replacement of sheaves, the unit should be rebalanced. To change the drive ratio, follow the steps in the Evaporator Fan Performance Adjustment section (page 51).

After 1 to 3 minutes of operation, check the belt tension. Also check tension frequently during the first 24 hours of operation and adjust if necessary. Periodically check belt tension throughout the run-in period, which is normally the initial 72 hours of operation.

ALIGNMENT — Make sure that fan shafts and motor shafts are parallel and level. The most common causes of misalignment are nonparallel shafts and improperly located sheaves. Where shafts are not parallel, belts on one side are drawn tighter and pull more than their share of the load. As a result, these belts wear out faster, requiring the entire set to be replaced before it has given maximum service. If misalignment is in the sheave, belts enter and leave the grooves at an angle, causing excessive belt and sheave wear.

Shaft Alignment — Check shaft alignment by measuring the distance between the shafts at 3 or more locations. If the distances are equal, then the shafts are parallel.

Sheave Alignment

1. To check the location of the fixed sheaves on the shafts, use a straightedge or a piece of string. If the sheaves are properly aligned, the string will touch them at the points indicated by the arrows in Fig. 36. Rotate each sheave a half revolution to determine whether the sheave is wobbly or the drive shaft is bent. Correct any misalignment.
2. With sheaves aligned, tighten cap screws evenly and progressively.

   NOTE: There should be a $^1/_8$-in. to $^1/_4$-in. gap between the mating part hub and the bushing flange. If the gap is closed, the bushing is probably the wrong size.
3. With taper-lock bushed hubs, be sure the bushing bolts are tightened evenly to prevent side-to-side pulley wobble. Check by rotating sheaves and rechecking sheave alignment. When substituting field-supplied sheaves for factory-supplied sheaves, only the motor sheave should be changed.

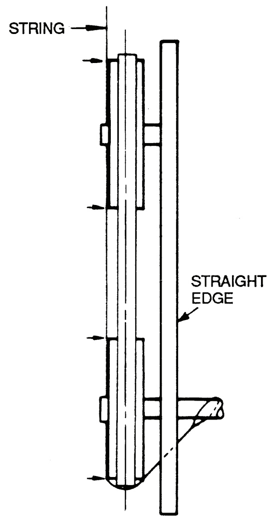



**Fig. 36 — Sheave Alignment**

## Evaporator Fan Performance Adjustment —

To change fan speeds from factory settings:

1. Shut off unit power supply.
2. Loosen nuts on the 4 carriage bolts in the mounting base. Using adjusting bolts and plate, slide the motor and remove the belt.
3. Loosen movable-pulley flange setscrew.
4. Screw the movable flange toward the fixed flange to increase speed, and away from the fixed flange to decrease speed. Increasing the fan speed increases the load on the motor. Do not exceed the maximum speed specified in Tables 3A and 3B.
5. Set the movable flange at nearest keyway of the pulley hub and tighten the setscrew. (See Tables 3A and 3B for speed change for each full turn of pulley flange.)
6. Replace and tighten the belts (see Belt Tension Adjustment section).
7. Restore power to the unit.

To align fan and motor pulleys:

1. Loosen fan pulley setscrews.
2. Slide fan pulley along fan shaft.
3. Make angular alignment by loosening motor from mounting plate.
4. Restore power to unit.

BELT TENSION ADJUSTMENT — Using a gage, apply 4 lb of force to the center of the belt and adjust the tension until a deflection of $^1/_{64}$-in. is achieved for every inch of shaft center distance. See Fig. 37.

Ideal belt tension is the lowest value under which belt slip will not occur at peak load conditions.

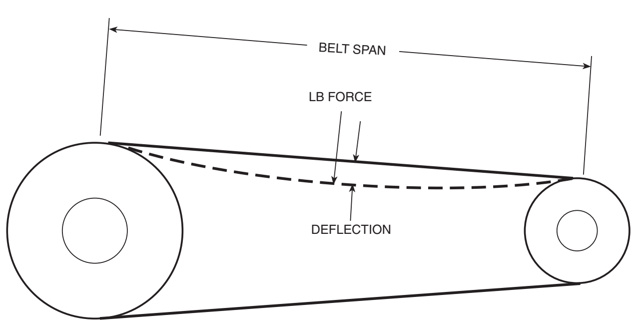



**Fig. 37 — Fan Belt Tension**

## Charging the System

REMOTE AIR-COOLED UNITS — The 50BVE,K,U,X units are shipped with a holding charge of dry nitrogen. Remote condensers, interconnecting piping, and refrigerant to charge the system are all field supplied.

To evacuate the system, refer to GTAC II, Module 4, Dehydration for Proper Evacuation and Dehydration Techniques.

To charge the 50BVE,K,U,X systems:

1. Add an initial minimum refrigerant charge after evacuation to allow the unit to start. Refer to Tables 25A and 25B. Additional refrigerant will be added based on the length of interconnecting piping and vertical separation between the indoor unit and the condenser(s).

**Table 25A — Minimum Operating Charge (lb), 50BVE,K Units Matched with 09DK Condensers**

| UNIT SIZE | 020 | 024 | 028 | 034 |
|---|---|---|---|---|
| Circuit 1...2 | 8.1...8.1 | 9.1...9.1 | 9.1...9.1 | 18...18 |

**Table 25B — Minimum Operating Charge (lb), 50BVU,X Units Matched with 09DK Condensers**

| UNIT SIZE | 034 | 044 | 054 | 064 |
|---|---|---|---|---|
| Circuit 1...2 | 18...18 | 10...10 | 18...18 | 18...18 |
| Circuit 3...4 | - | 10...10 | 18...18 | 18...18 |

2. To finish charging the system, make sure the unit is running at full-load operating conditions. Charge to a clear sight glass. Refer to GTAC II, Module 5, Charging, Recovery, Recycling and Reclamation and the Refrigerant Service Techniques manual for proper charging techniques.
3. Add 10 lb of R-22 or R-410A over a clear sight glass to flood subcooler section of the condenser coils.
4. Alternately, and as a double-check, when properly charged at full-load operating conditions, there should be 15 F subcooling entering the TXV (the difference between saturated condenser temperature and actual liquid temperature entering the TXV).

**Compressor Oil —** All units are factory charged with oil. It is not necessary to add oil unless compressor(s) is removed from the unit. If necessary, oil can be removed/charged via Schrader fitting. Operate the system at high evaporator temperature prior to oil recharge to assist oil return to the compressor(s) from other system components. If necessary, recharge the system as shown in Table 26.

**Table 26 — Oil Recharge**

| 50BV UNIT | SIZE | COMPRESSOR | OIL RECHARGE (oz) | OIL TYPE | PART NUMBER |
|---|---|---|---|---|---|
| C,E, Q,J,K | 020 | ZR94KC | 81 | 3GS 150 viscosity yellow mineral oil | P903-0101 |
| | 024 | ZR108KC | 106 | | |
| | 028 | ZR144KC | 106 | | |
| | 034 | ZR19M3 | 137 | | |
| T,U, V,W,X | 034 | ZR19M3 | 137 | | |
| | 044 | ZR125KC | 106 | | |
| | 054 | ZR16M3 | 137 | | |
| | 064 | ZR19M3 | 137 | | |

# TROUBLESHOOTING

Refer to Tables 27-29 to determine the possible cause of the problem and the associated procedure necessary to correct it. See Fig. 38-47 for unit and control wiring.

## Table 27 — Run Test Troubleshooting (VAV Units Only)

| PROBLEM | POSSIBLE CAUSE |
|---|---|
| Control modules do not have lights when unit power is on. | Transformer open. Circuit breaker open. Power wiring open. Module failure. |
| Control display does not light up when unit power is on. | Connection location. Interface cable open. Display failure. |
| Run test will not start. | Pre-existing ALARM (red)? Not “Logged in” with password. Switch not in local. |
| WARN (yellow) LED does not light during run test. | Wiring open. Lamp failure. Control module failure. |
| ALARM (red) LED does not light during run test. | Wiring open. Lamp open. Control module failure. |
| Run test stops, ALARM (red) LED light is lit after it blinks once. | Bypass switch to LINE. Mode switch to OFF. Duct high pressure switch open. Fire shutdown input or jumper open. Supply air temp out of range. Duct static pressure sensor out of range. Compressor resistor board wiring error or failure. |
| Fan does not start/ALARM (red) LED blinks 2 times. | Fan relay failure. |
| Run test stop, ALARM (red) LED is lit after blinking 3 times. | Wiring open. VFD connection error. VFD setup error. Fan relay failure. Current isolator failure. Control module failure. |
| Run test stop, ALARM (red) LED is lit after it blinks 4 times. Fan does not increase speed. | VFD connection error. VFD setup error. Current isolator load adjustment too low. |
| Fan does not stop after ALARM (red) LED blinks 5 times. | Fan relay failure. |
| Fan rotation is backwards. | VFD to motor wiring sequence error. VFD setup error. |
| Run test stop, ALARM (red) LED is lit after blinking 6 times. Compressor 1 does not start. | Wiring open. Compressor resistor board wiring error or failure. High pressure switch, low pressure switch, coil frost switch, or compressor protection module open. Compressor relay failure. Contactor failure. Control module failure. No refrigerant charge. |
| Run test stop, ALARM (red) LED is lit after blinking 7 times. Compressor 2 does not start. | Wiring open. Compressor resistor board wiring error or failure. High pressure switch, low pressure switch, coil frost switch, or compressor protection module open. Compressor relay failure. Contactor failure. Control module failure. No refrigerant charge. |
| Run test stop, ALARM (red) LED is lit after blinking 8 times. Compressor 3 does not start. | Wiring open. Compressor resistor board wiring error or failure. High pressure switch, low pressure switch, coil frost switch, or compressor protection module open. Compressor relay failure. Contactor failure. Control module failure. No refrigerant charge. |
| Run test stop, ALARM (red) LED is lit after blinking 9 times. Compressor 4 does not start. | Wiring open. Compressor resistor board wiring error or failure. High pressure switch, low pressure switch, coil frost switch, or compressor protection module open. Compressor relay failure. Contactor failure. Control module failure. No refrigerant charge. |
| Compressor rotation is backwards. | Field power wiring sequence error. Compressor power wiring sequence error. |
| “C” message in I/O status display. | No input signal or communication failure. |
| “Service” message in I/O status display. | Value is forced from 6400 keypad entry. |
| “Supervisor” message in I/O status display. | Value is forced from network communication (i.e., PC). |
| ALARM (red) LED always on, will not enter run test. | SAT, DSP, CSMUX, DHS, or PHASE input values. Mode switch OFF. |

NOTE: For more information on VAV controls, refer to the 50BV,XJ Controls Operation and Troubleshooting Manual.

## Table 28 — Unit Troubleshooting

| PROBLEM | POSSIBLE CAUSE | CORRECTION PROCEDURE |
|---|---|---|
| Unit Will Not Start. | Loss of unit power | Check power source.<br>Check fuses, circuit breakers, disconnect switch.<br>Check electrical contacts. |
| | Unit voltage not correct | Check and correct. |
| | Open fuse | Check for short circuit in unit. |
| | Open protection device | Check relays (phase monitor option), contacts, pressure switches. |
| | Unit or motor contactor out of order | Test and replace if necessary. |
| Fan Does Not Operate. | Contactor or relay overload or out of order | Test and replace if necessary. |
| | VFD not running | Perform VFD diagnostic test. |
| | Motor defective | Test and replace if necessary. |
| | Broken belt | Replace belt. |
| | Loose electrical contact | Tighten contact. |
| Compressor is Noisy, But Will Not Start. | Under voltage | Check and correct. |
| | Defect in compressor motor | Replace compressor. |
| | Missing phase | Check and correct. |
| | Compressor seized | Check and replace if necessary. |
| Compressor Starts, But Does Not Continue to Run. | Compressor or contact defect | Test and replace if necessary. |
| | Unit is under charged | Check and correct any leaks. Add refrigerant. |
| | Unit is too big | Check load calculation. |
| | Compressor is overloaded | Check protection device and replace.<br>Check for missing phase.<br>Check TXV.<br>Check temperature in suction discharge line. |
| Unit is Noisy. | Compressor noise | Check TXV and replace if necessary.<br>Compressor rotation incorrect; check and correct.<br>Check internal noise. |
| | Tube vibration or condenser water problem | Check and correct. |
| | Unit panel or part vibrating | Check and tighten appropriate part. |
| Unit Runs Continuously, But Has Low Capacity. | Unit is too small | Check load calculation. |
| | Low refrigerant or noncondensing gas present | Check for leaks and add refrigerant or gas as necessary. |
| | Compressor defect | Check pressure and amps. Replace if necessary. |
| | Insufficient flow of refrigerant in evaporator | Check filter drier and replace if necessary.<br>Check TXV and adjust or replace if necessary.<br>Check position of TXV bulb and equalizer. |
| | Oil in evaporator | Drain evaporator. |
| | Low airflow | Check filters, and clean or replace as necessary.<br>Check coils, and clean as necessary.<br>Check for restrictions in ductwork.<br>Check fan rotation and adjust.<br>Check fan motor.<br>Check belts for wear. |
| High Discharge Pressure. | Low waterflow in condenser | Purge air. |
| | Dirty condenser tubes. | Clean condenser. |
| | High temperature in condenser water | Check water tower fans and pumps. |
| | Overcharged | Check and reclaim excess charge.<br>Adjust subcooling. |
| | Noncondensing gas present | Verify and correct. |

LEGEND

**TXV** — Thermostatic Expansion Valve
**VFD** — Variable Frequency Drive

### Table 29 — CV Units LED Diagnostic Codes

| NO. OF BLINKS | DESCRIPTION |
|---|---|
| 1 | 1st Stage High-Pressure Lockout |
| 2 | 1st Stage Low-Pressure Lockout |
| 3 | 2nd Stage High-Pressure Lockout |
| 4 | 2nd Stage Low-Pressure Lockout |
| 5 | Freeze Protection Lockout* |
| 6 | Condensate Overflow Lockout* |

*Freeze protection and condensate overflow lockout require optional sensors.
NOTE: The main control board has a red LED (light-emitting diode) for fault indication and will blink a code as described above. Count the number of blinks to determine the lockout condition.

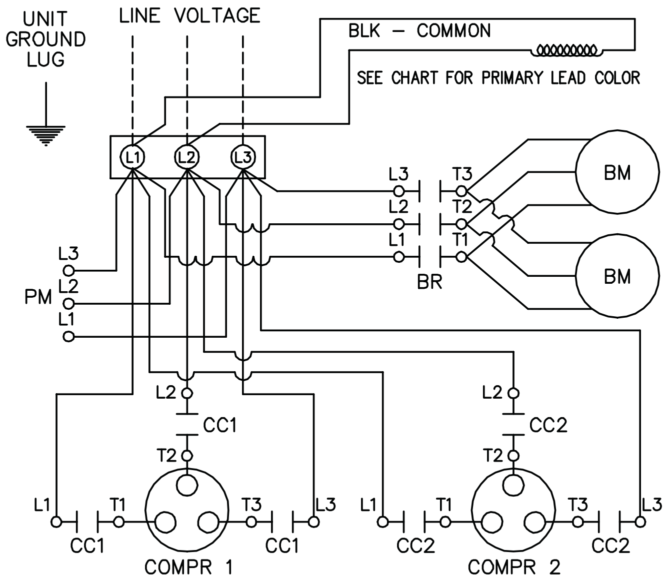
**Forcing and Clearing an Input or Output (VAV Only) —** During unit operation and/or troubleshooting, it may be necessary or desirable to clear an input or output. Tables 30 and 31 describe the procedure for forcing and clearing inputs and outputs.

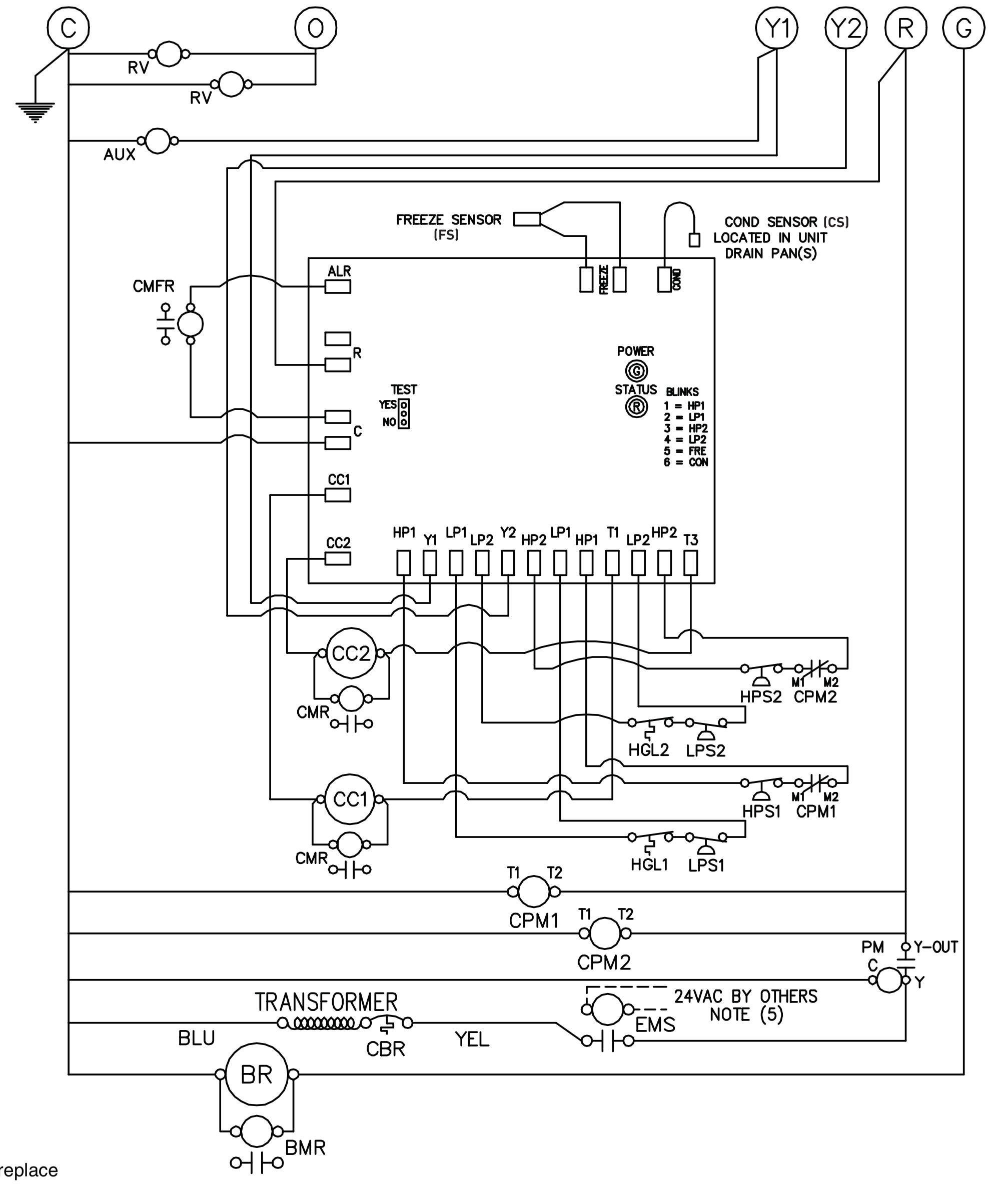
### Table 30 — Forcing an Input or Output

| STEP NO. INSTRUCTION/ACTION | RESULT |
|---|---|
| **1. Press 3, SET, ENTER.** | “Controller Password” |
| **2. Press ENTER.** | “Log in to Controller” “Enter Password” |
| **3. Press 1111, ENTER.** | “Log in to Controller” “Logged in” |
| **4. Press STAT.** | “Hardware Points” |
| **5. Press ENTER.** | “Supply Air Temperature” |
| **6. Press down arrow to obtain desired item.** | (NOTE: Order is PCB1 I/O, PCB2 I/O, PCB3 I/O.) |
| **7. Key in force value (1=on/start, 0 = off/stop), ENTER.** | Force value/status “Service” |

### Table 31 — Clearing a Forced Input or Output

| STEP NO. INSTRUCTION/ACTION | RESULT |
|---|---|
| **1. Press 3, SET, ENTER.** | “Controller Password” |
| **2. Press ENTER.** | “Log in to Controller” “Enter Password” |
| **3. Press 1111, ENTER.** | “Log in to Controller” “Logged in” |
| **4. Press STAT.** | “Hardware Points” |
| **5. Press ENTER.** | “Supply Air Temperature” |
| **6. Press down arrow to obtain desired item.** | (NOTE: Order is PCB1 I/O, PCB2 I/O, PCB3 I/O.) |
| **7. Press CLEAR, ENTER.** | Auto value/status (NOTE: “Service” must be gone.) |




LEGEND

Standard Components Legend:

**#1** — First Stage
**#2** — Second Stage
**BM** — Blower Motor (1 or 2 per Unit)
**BR** — Blower Relay
**CBR** — 24-vac Circuit Breaker
**CC** — Compressor Contactor
**CPM** — Compressor Protection Module (15 Ton and Larger Compressors)
**HPS** — High Pressure Switch
**LPS** — Low Pressure Switch
**RV** — Reversing Valve

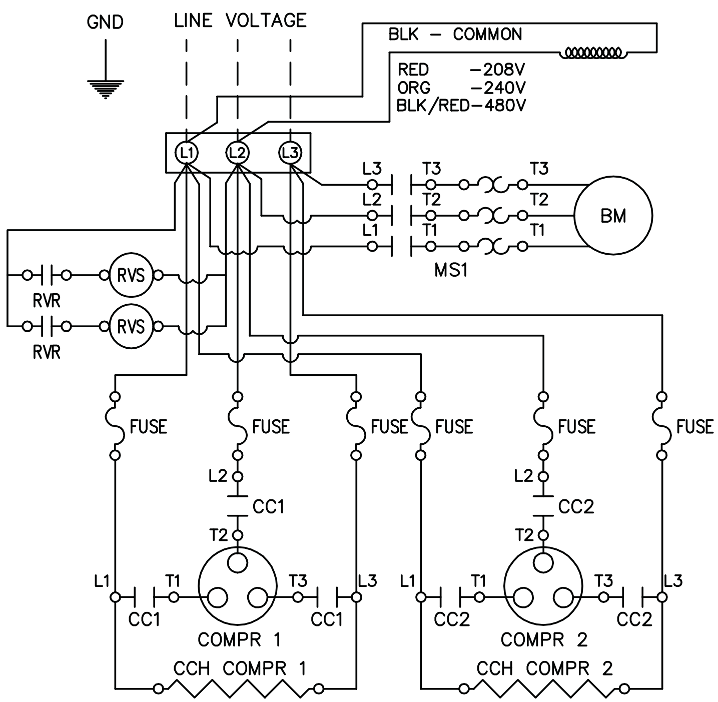
Optional Components Legend:

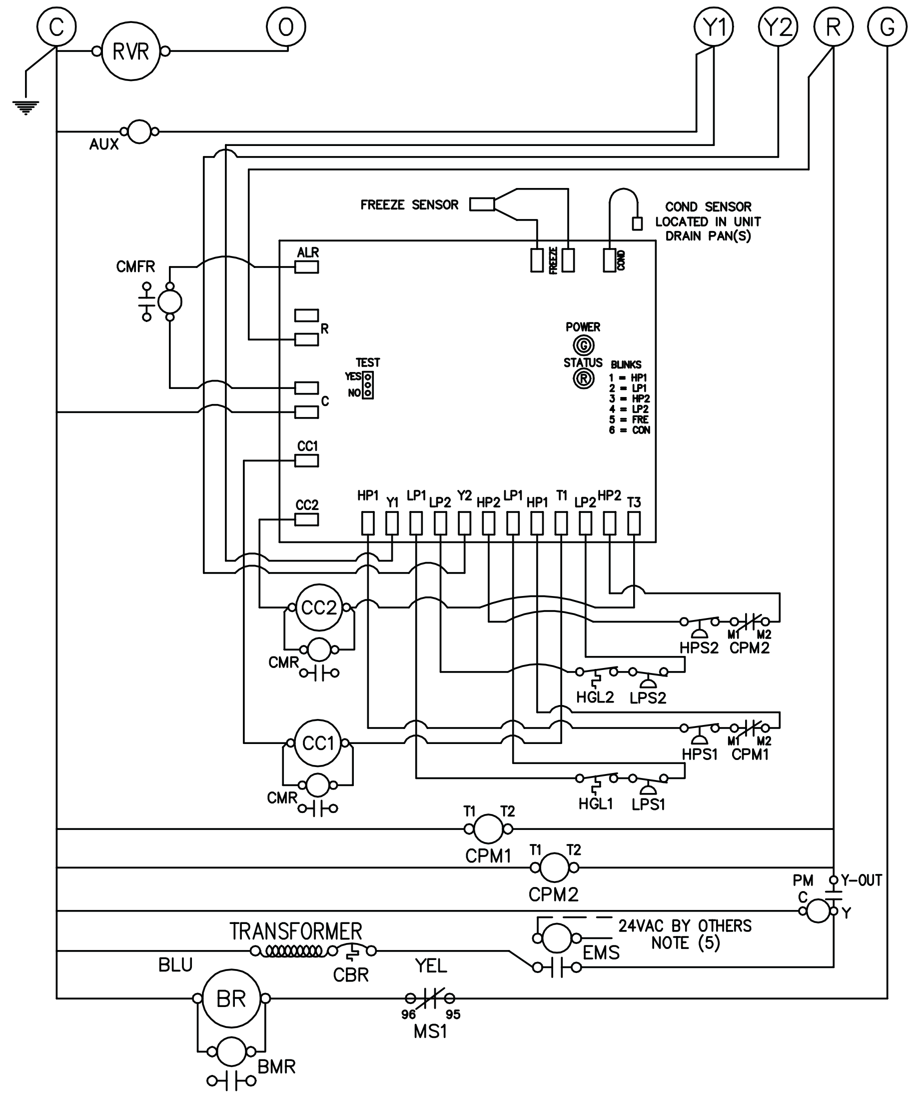
**AUX** — Auxiliary Relay (for Pumps, Valves, etc.)
**BMR** — Blower Motor Relay
**CMFR** — Compressor Malfunction Relay
**CMR** — Compressor Monitor Relay
**CS** — Condensate Sensor (One per Drain Pan)
**EMS** — Energy Management System Relay
**FS** — Freeze Sensor
**HGL** — Hot Gas Limit (Bypass Only)
**PM** — Phase Monitor
——— Factory Wire
– — – Field Wire

| TRANSFORMER PRIMARY LEAD COLOR | |
|---|---|
| **120** | White |
| **208** | Red |
| **240** | Orange |
| **277** | Brown |
| **380** | Purple or Yellow |
| **460** | Black/Red |
| **575** | Gray |

NOTES:
1. See unit nameplate for electrical rating.
2. All field wiring must be in accordance with NEC-NFPA #70.
3. 208/230-v units are factory wired for 208-v operation. For 230-v operation, remove ORG lead and replace with RED lead. Cap all unused leads.
4. Check phase rotation on all scroll compressor units. Reverse rotation will damage the compressor and void unit warranty.
5. For alternative EMS coil voltages, consult factory.
6. UPM board includes built in 30 to 60-second random start, 5-minute delay on break, 90-second low pressure bypass, and 5-second second stage delay.
7. Setting the UPM board test mode jumper to yes reduces all time delays to 5 seconds.
8. “Freeze” pins on UPM board must be jumped if freeze sensor is not installed.

**Fig. 38 — 50BVC,E,Q020-034 Constant Volume Wiring Schematic**



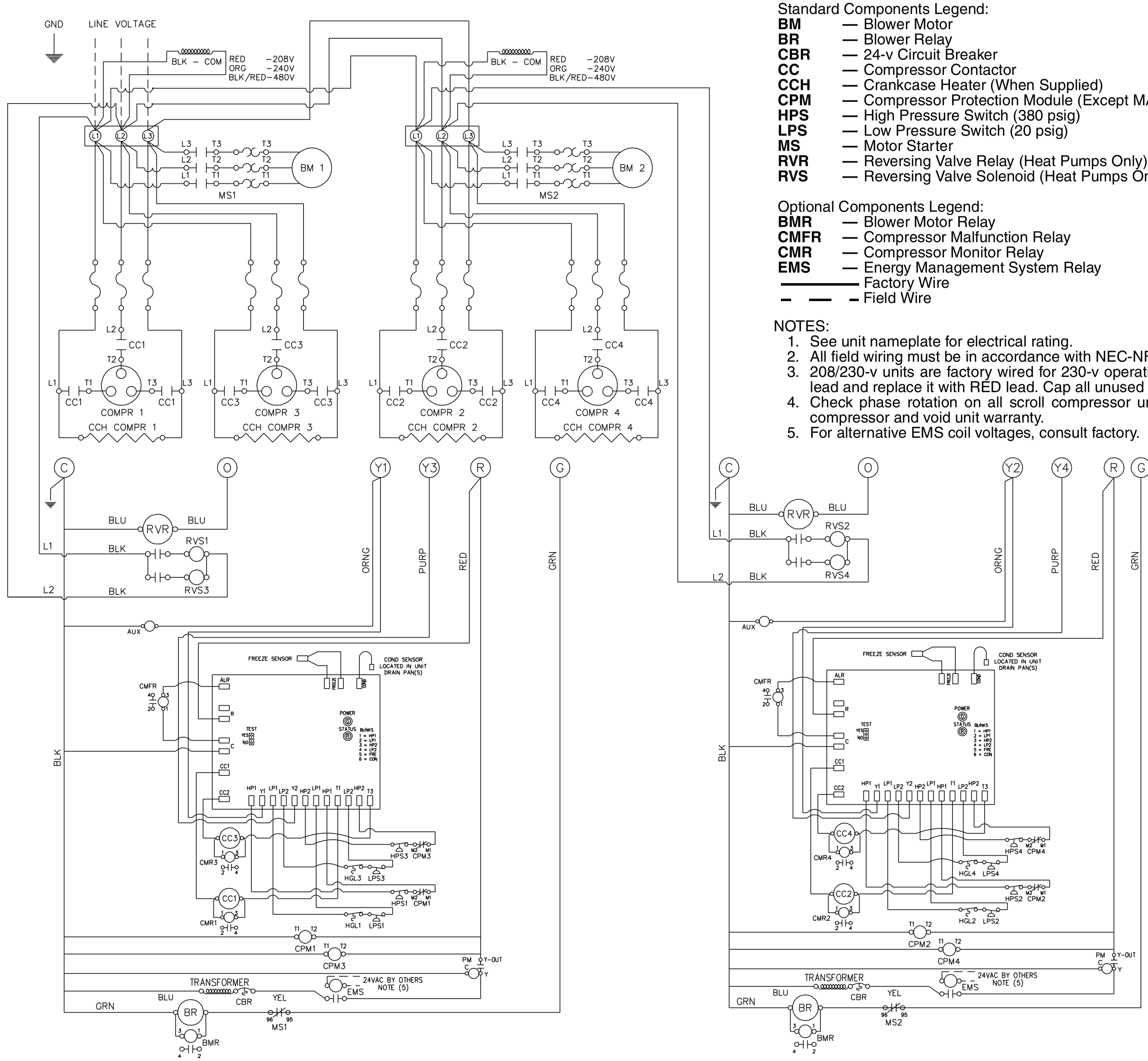

LEGEND

Standard Components Legend:
**#1** — First Stage
**#2** — Second Stage
**BM** — Blower Motor
**BR** — Blower Relay
**CBR** — 24-vac Circuit Breaker
**CC** — Compressor Contactor
**CCH** — Crankcase Heater (When Supplied)
**CPM** — Compressor Protection Module
**HPS** — High Pressure Switch
**LPS** — Low Pressure Switch
**MS** — Motor Starter
**RVR** — Reversing Valve Relay (Heat Pumps Only)
**RVS** — Reversing Valve Solenoid (Heat Pumps Only)
——— Factory Wire
– — – Field Wire

Optional Components Legend:
**CMFR** — Compressor Malfunction Relay
**CMR** — Compressor Monitor Relay
**EMS** — Energy Management System Relay
**FSR** — Freeze/Condensate Sensor Relay
Freeze/Condensate Sensor Module (includes FSR)
Condensate Sensor
Freeze Sensor

NOTES:
1. See unit nameplate for electrical rating.
2. All field wiring must be in accordance with NEC-NFPA #70.
3. 208/230-v units are factory wired for 230-v operation. For 208-v operation, remove ORG lead and replace with RED lead. Cap all unused leads.
4. Check phase rotation on all scroll compressor units. Reverse rotation will damage the compressor and void unit warranty.
5. For alternative EMS coil voltages, consult factory.
6. UPM board includes built in 30 to 60-second random start, 5-minute delay on break, 90-second low pressure bypass, and 5-second second stage delay.
7. Setting the test mode jumper to yes reduces all time delays to 5 seconds.

**Fig. 39 — 50BVT,U,V034 Constant Volume Wiring Schematic**




## LEGEND

Standard Components Legend:

**BM** — Blower Motor
**BR** — Blower Relay
**CBR** — 24-v Circuit Breaker
**CC** — Compressor Contactor
**CCH** — Crankcase Heater (When Supplied)
**CPM** — Compressor Protection Module (Except MA480)
**HPS** — High Pressure Switch (380 psig)
**LPS** — Low Pressure Switch (20 psig)
**MS** — Motor Starter
**RVR** — Reversing Valve Relay (Heat Pumps Only)
**RVS** — Reversing Valve Solenoid (Heat Pumps Only)

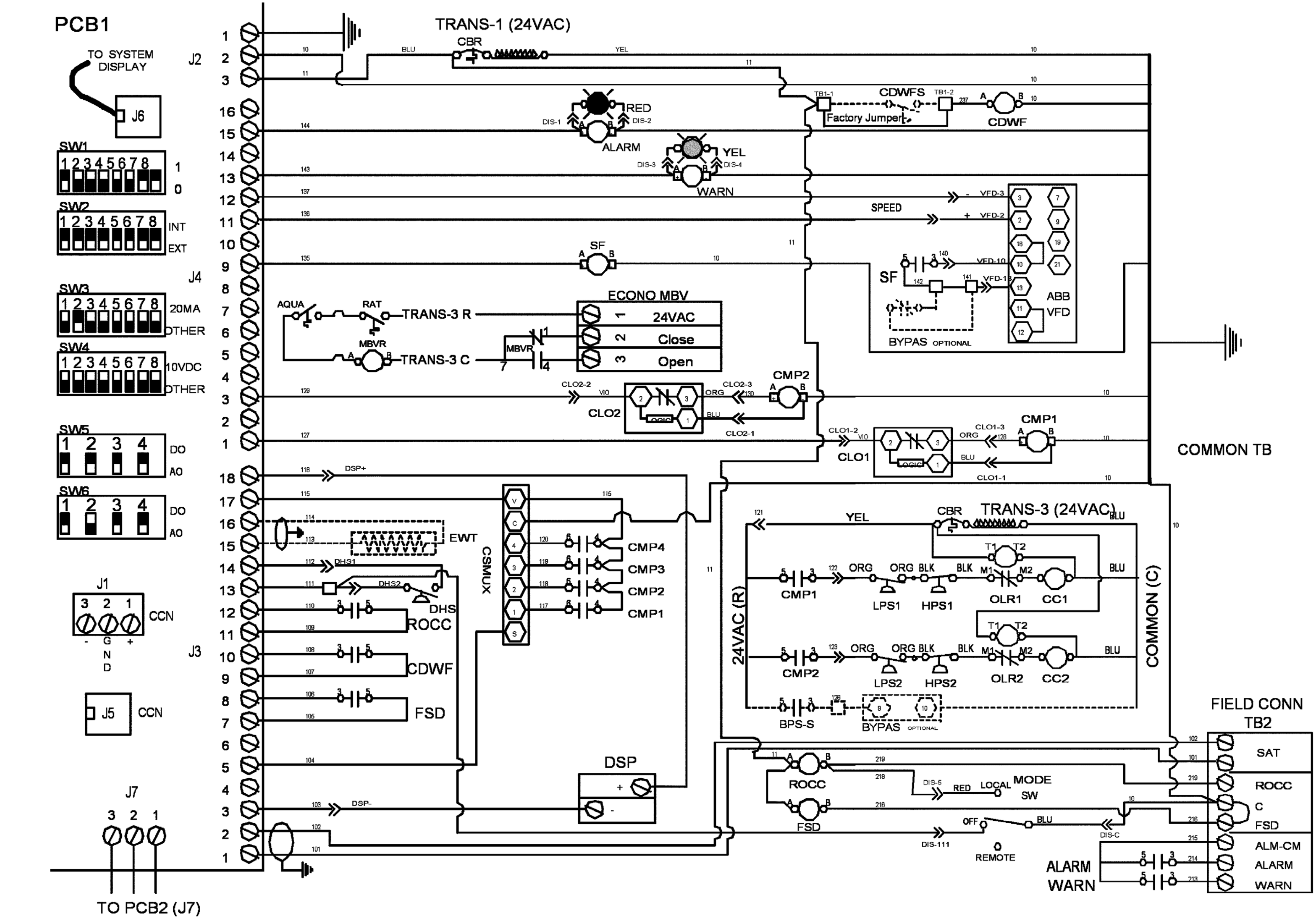
Optional Components Legend:

**BMR** — Blower Motor Relay
**CMFR** — Compressor Malfunction Relay
**CMR** — Compressor Monitor Relay
**EMS** — Energy Management System Relay
——— Factory Wire
– — – Field Wire

NOTES:

1. See unit nameplate for electrical rating.
2. All field wiring must be in accordance with NEC-NFPA #70.
3. 208/230-v units are factory wired for 230-v operation. For 208-v operation, remove ORG lead and replace it with RED lead. Cap all unused leads.
4. Check phase rotation on all scroll compressor units. Reverse rotation will damage the compressor and void unit warranty.
5. For alternative EMS coil voltages, consult factory.

**Fig. 40 — 50BVT,U,V044-064 Constant Volume Wiring Schematic**




NOTE: Jumper installed for condenser water flow switch when not supplied.

**Fig. 41 — 50BVJ,K020-034 Variable Air Volume Low Voltage Schematic**

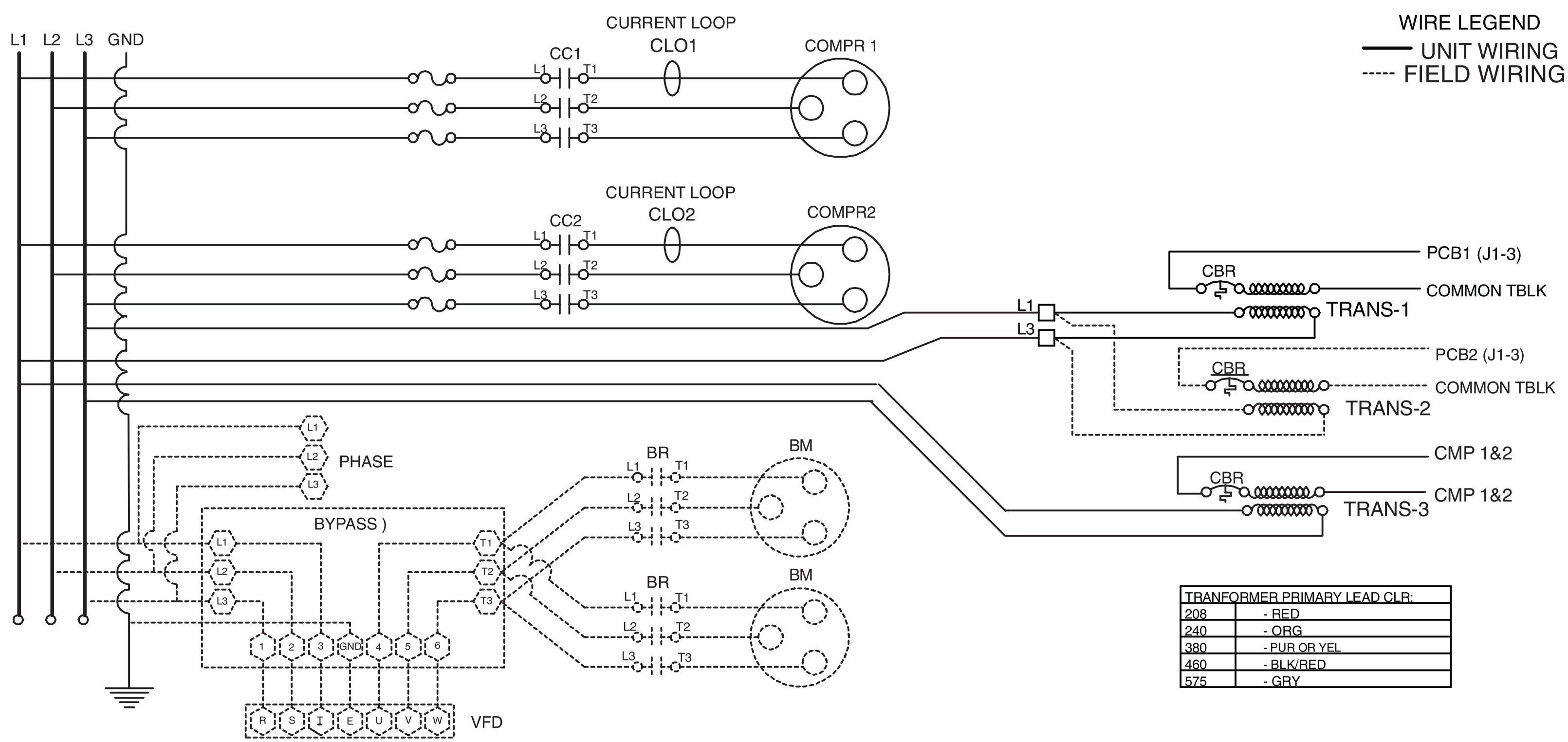
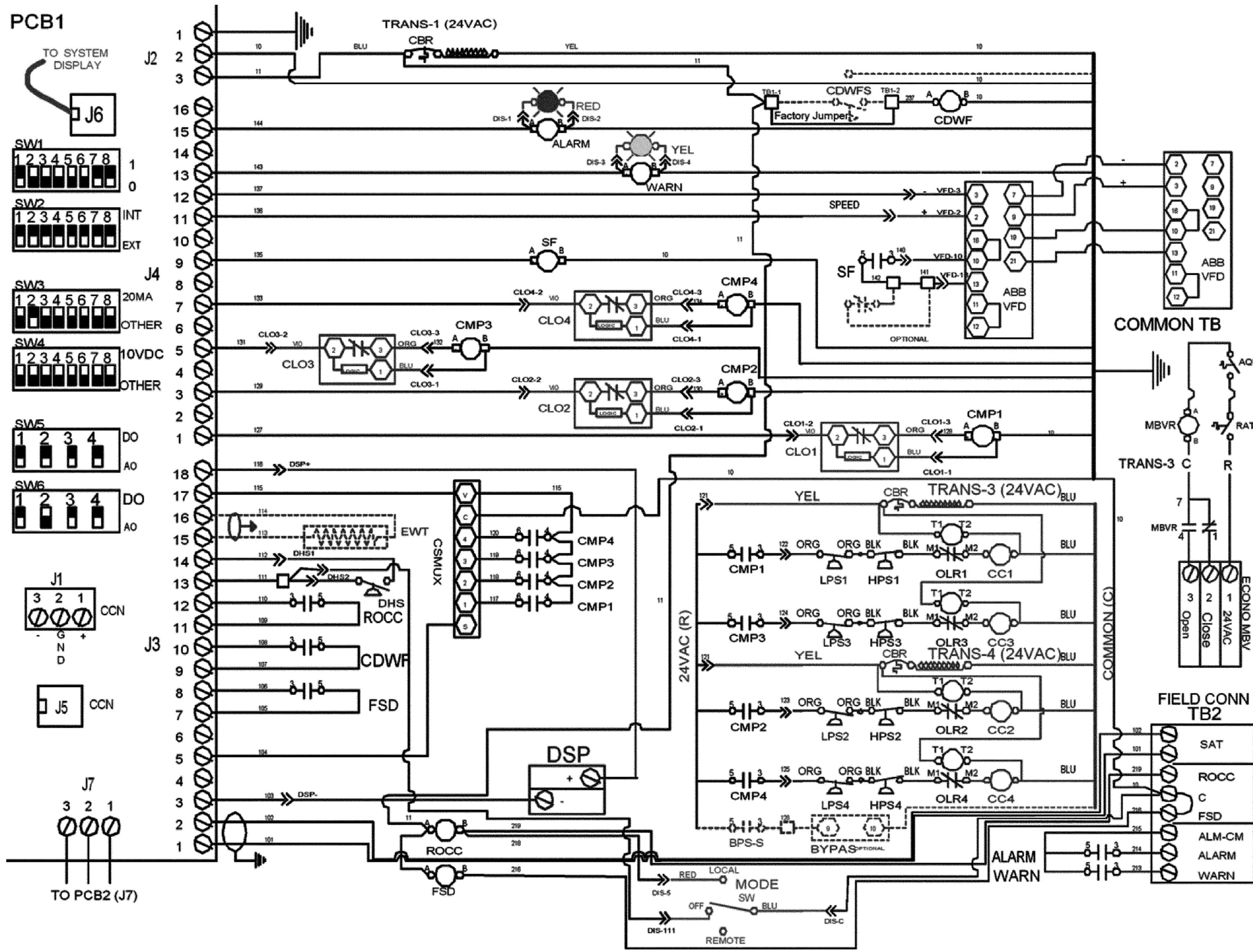



**Fig. 42 — 50BVJ,K020-034 Variable Air Volume High Voltage Schematic**




NOTE: Jumper installed for condenser water flow switch when not supplied.

**Fig. 43 — 50BVW,X034-064 Variable Air Volume Low Voltage Schematic**

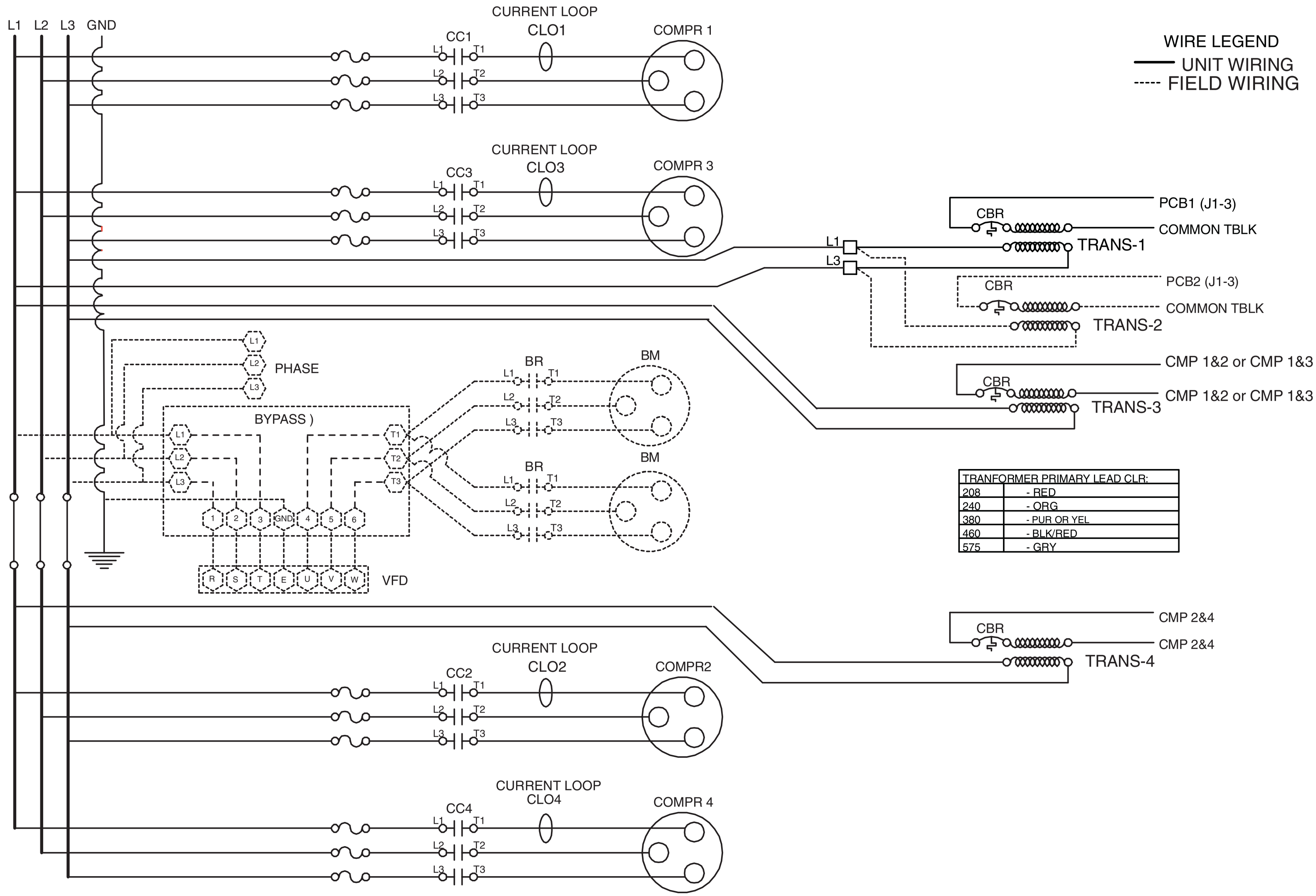



Fig. 44 — 50BVW,X034-064 Variable Air Volume High Voltage Schematic

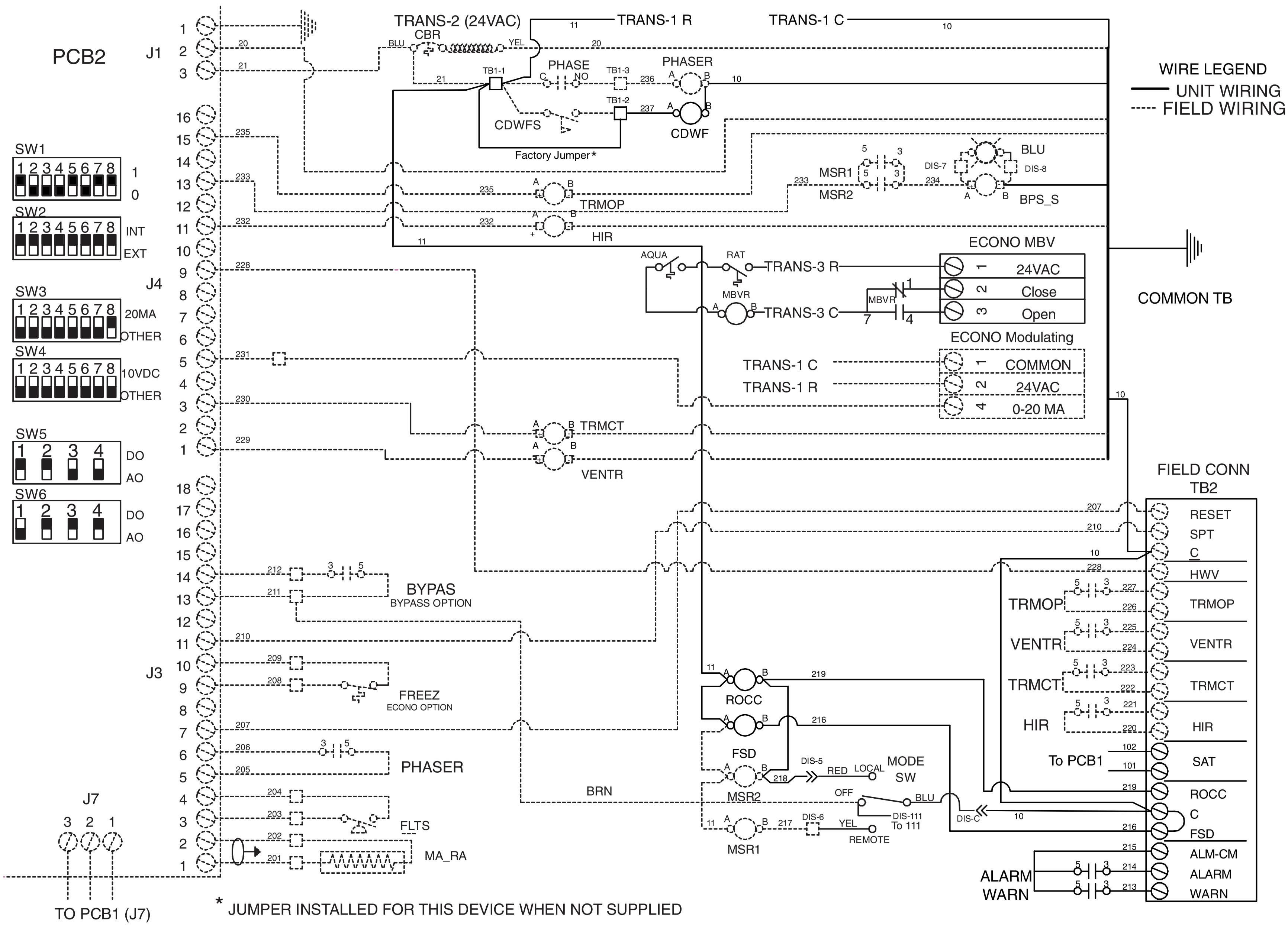



**Fig. 45 — 50BVJ,K,W,X Field-Installed Low Voltage Schematic (PCB 2 Module)**

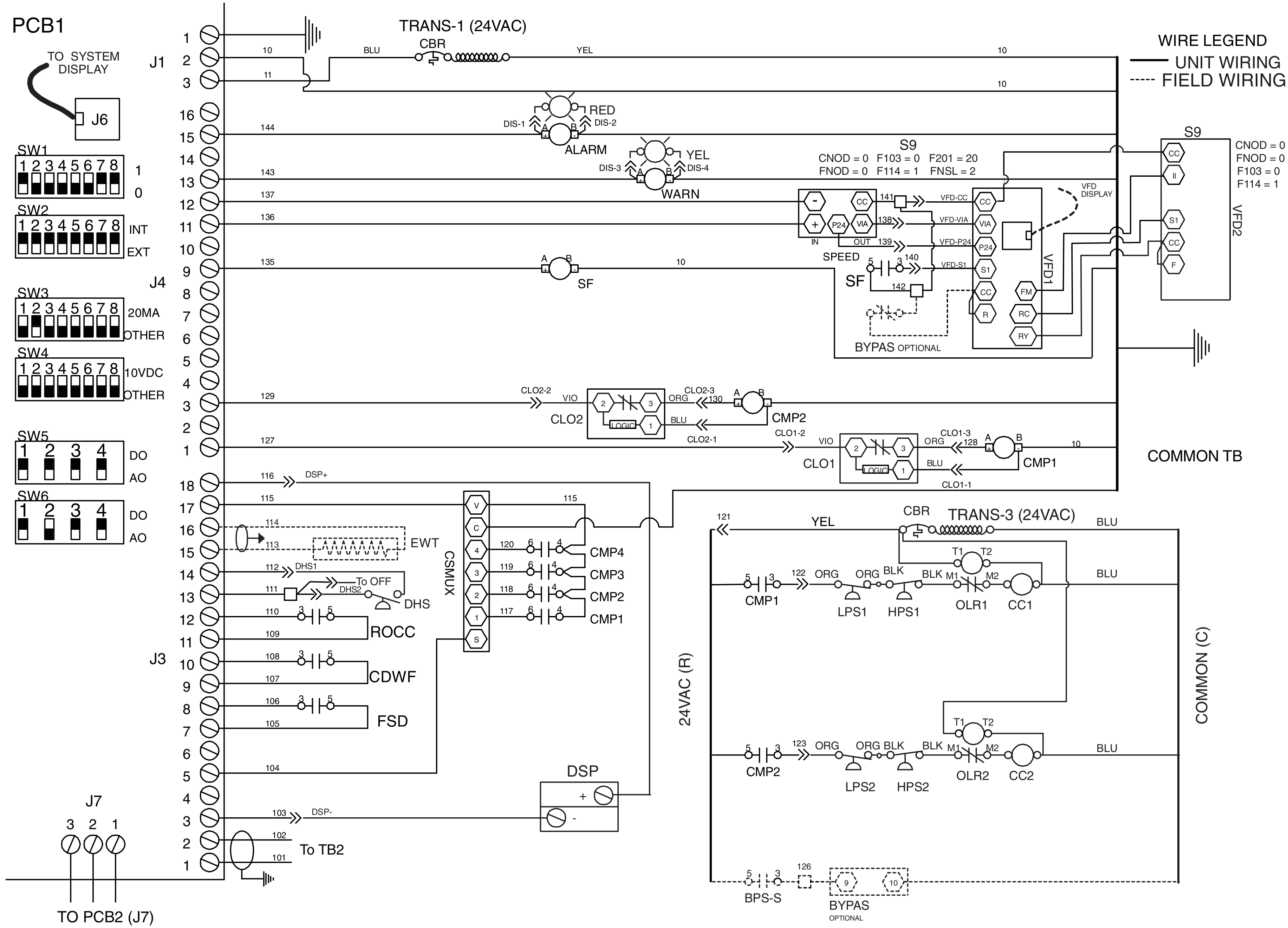



**Fig. 46 — 50BVJ,K Field-Installed Low Voltage Schematic (PCB 1 Module)**

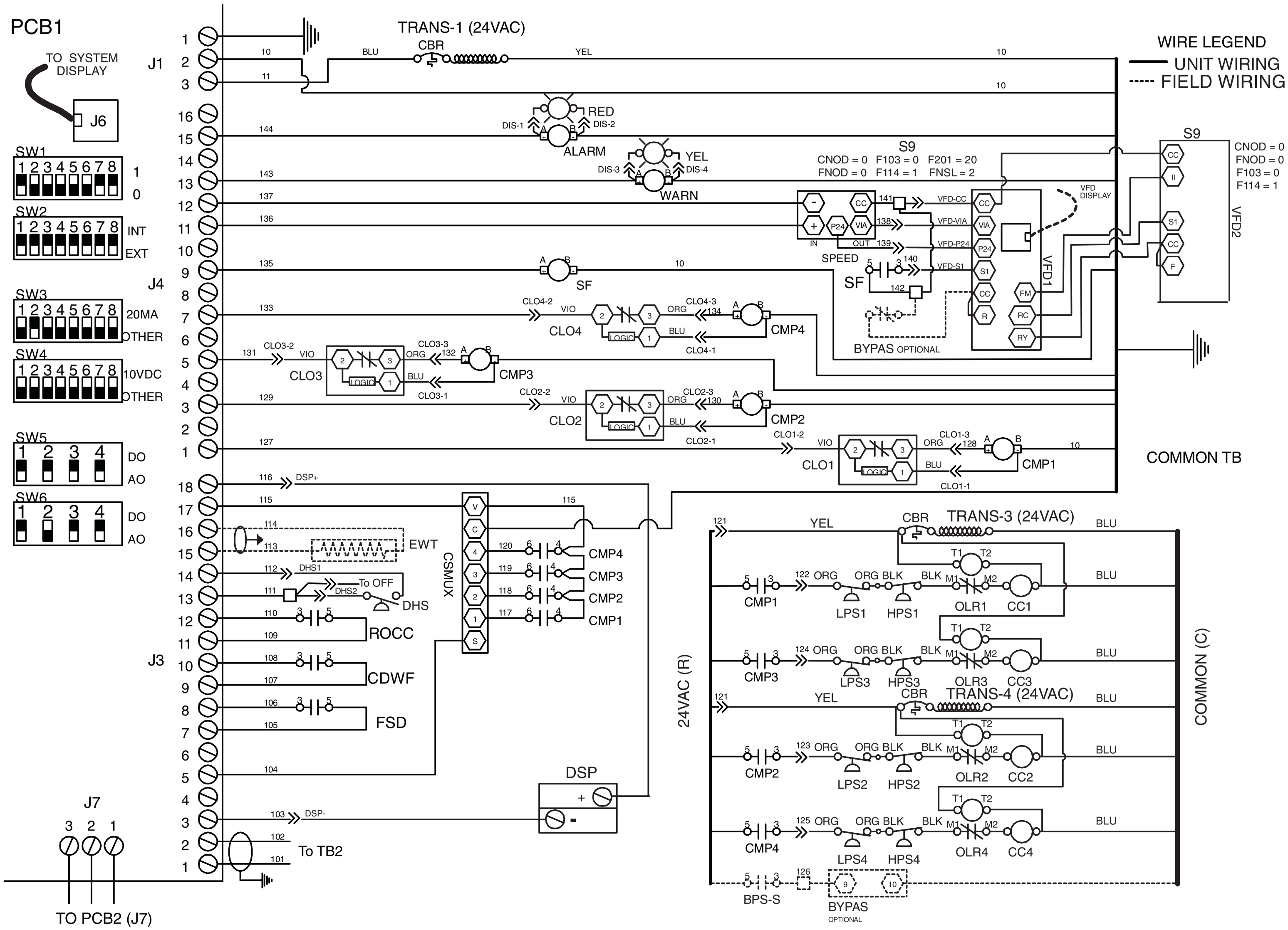



**Fig. 47 — 50BVW,X Field-Installed Low Voltage Schematic (PCB 1 Module)**

## LEGEND AND NOTES FOR FIG. 41-47

LEGEND

| | | |
|---|---|---|
| **ALARM** | — | Unit Alarm Relay (Critical Fault) |
| **ALM-CM** | — | Alarm/Warning Relay Common |
| **AO** | — | Analog Output |
| **AQUA** | — | Aquastat |
| **BM** | — | Blower Motor |
| **BPS_S** | — | Fan Start/Stop Relay (VFD Bypass Mode) |
| **BR** | — | Blower Relay |
| **BYPAS** | — | VFD Bypass Control |
| **CBR** | — | Circuit Breaker |
| **CC** | — | Compressor Contactor |
| **CCN** | — | Carrier Comfort Network® |
| **CDWF** | — | Condenser Waterflow Relay |
| **CDWFS** | — | Condenser Waterflow Switch |
| **CLO** | — | Compressor Lockout Control |
| **CMP** | — | Compressor Control Relay |
| **COMPR** | — | Compressor |
| **CSMUX** | — | Signal Multiplexer-Comp Status |
| **DHS** | — | Duct High Static Limit Switch |
| **DO** | — | Digital Output |
| **DSP** | — | Duct Static Pressure Transducer |
| **ECONO** | — | Economizer Valve/Damper Control |
| **EWT** | — | Entering Water Temperature Sensor |
| **FLTS** | — | Filter Status Switch |
| **FREEZ** | — | Freeze Thermostat (Water Economizer) |
| **FSD** | — | Fire Alarm/Shutdown |
| **GND** | — | Ground |
| **HIR** | — | Heat Interlock Relay |
| **HPS** | — | High Refrigerant Pressure Switch |
| **LPS** | — | Low Refrigerant Pressure Switch |
| **MA_RA** | — | Mixed/Return Air Temperature Sensor |
| **MBVR** | — | Motorized Ball Valve Relay |
| **MSR** | — | Local/Remote Control Relays |
| **OLR** | — | Compressor Motor Protector |
| **PCB1** | — | Unit Control Board |
| **PCB2,3** | — | I/O Expansion Board |
| **PHASE** | — | Phase/Rotation Monitor |
| **PHASER** | — | Phase Monitor Relay |
| **RAT** | — | Return Air Thermostat |
| **RESET** | — | External Reset |
| **ROCC** | — | Remote Occupancy |
| **SAT** | — | Supply Air Temp. Sensor |
| **SPT** | — | Space/Zone Temperature Sensor |
| **SF** | — | Supply Fan Start/Stop Relay |
| **SPEED** | — | 0-10 VDC Signal Isolator for VFD |
| **SW** | — | Switch |
| **T** | — | Transformer |
| **TB2** | — | Terminal Block for Field Connections |
| **TRANS** | — | Transformer |
| **TRMCT** | — | VAV Terminals Control |
| **TRMOP** | — | VAV Terminals Open |
| **VENTR** | — | Ventilation Output |
| **VFD** | — | Variable Frequency Drive |
| **WARN** | — | Unit Warning Relay (Non-Critical Fault) |
| ——— | | Factory Wiring |
| ▬▬ ▪ | | Field Wiring |

NOTES:
1. Partial wiring shown on both power and control diagrams.
2. Class 2 transformer TRANS-1 is wired into separate circuit. Do not interconnect other transformers or circuits; circuit separation or compressor transformers from low voltage control panel transformers shall be maintained.
3. Shielded wire shall have drain wire connected to VFD ground screw. The floating end of the drain wire shall be insulated.
4. Shielded wire shall have drain wire connected to the control panel, adjacent to the PCB. The floating end of the drain wire shall be insulated.

# START-UP CHECKLIST

(Fill out this form on Start-Up and file in job folder)

## I. PRELIMINARY INFORMATION:

**50BV UNIT:** MODEL NO. ____________________ SERIAL NO. ____________________

START-UP DATE: ______________________________________

## II. PRE-START-UP:

VERIFY ALL SHIPPING MATERIALS HAVE BEEN REMOVED FROM THE UNIT

IS THERE ANY SHIPPING DAMAGE? ________________ IF SO, WHERE ________________

_________________________________________________________

WILL THIS DAMAGE PREVENT UNIT START-UP? (Y/N) _______

CHECK POWER SUPPLY. DOES IT AGREE WITH UNIT? (Y/N) _______

HAS THE GROUND WIRE BEEN CONNECTED? (Y/N) _______

HAS THE CIRCUIT PROTECTION BEEN SIZED AND INSTALLED PROPERLY? (Y/N) _______

ARE THE POWER WIRES TO THE UNIT SIZED AND INSTALLED PROPERLY? (Y/N) _______

HAS THE CORRECT INPUT POWER PHASE SEQUENCE BEEN CONFIRMED WITH A METER? (Y/N) _______

HAS THE FAN AND MOTOR PULLEY BEEN CHECKED FOR PROPER ALIGNMENT AND DOES THE FAN BELT HAVE PROPER TENSION? (Y/N) _______

HAS WATER BEEN PLACED IN DRAIN PAN TO CONFIRM PROPER DRAINAGE? (Y/N) _______

ARE PROPER AIR FILTERS IN PLACE AND CLEAN? (Y/N) _______

VERIFY THAT THE UNIT IS INSTALLED WITHIN LEVELING TOLERANCES (Y/N) _______

### CONTROLS

HAS THE DUCT STATIC PRESSURE PROBE BEEN INSTALLED? (Y/N) _______

HAVE CONTROL CONNECTIONS BEEN MADE AND CHECKED? (Y/N) _______

ARE ALL WIRING TERMINALS (including main power supply) TIGHT? (Y/N) _______

HAS AUTOMATIC RUN TEST BEEN COMPLETED? (Y/N) _______

HAS THE VFD CHECKOUT BEEN COMPLETED? (Y/N) _______

### PIPING

HAVE LEAK CHECKS BEEN MADE AT COMPRESSOR, CONDENSER, EVAPORATOR, TXVs (Thermostatic Expansion Valves), SOLENOID VALVES, FILTER DRIERS, AND FUSIBLE PLUGS WITH A LEAK DETECTOR? (Y/N) _______

HAVE WATER AND STEAM VALVES BEEN OPENED (to fill piping and heat exchangers)?(Y/N) _______

HAS AIR PURGE BEEN PERFORMED? (Y/N) _______

### ELECTRICAL

CHECK VOLTAGE IMBALANCE

LINE-TO-LINE VOLTS: AB ______ V AC ______ V BC ______ V

(AB + AC + BC)/3 = AVERAGE VOLTAGE = __________ V

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = __________ V

VOLTAGE IMBALANCE = 100 X (MAX DEVIATION)/(AVERAGE VOLTAGE) = __________ % (IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM; CALL LOCAL POWER COMPANY FOR ASSISTANCE.)

## III. START-UP:

CHECK FAN SPEED AND RECORD. ________

AFTER AT LEAST 15 MINUTES RUNNING TIME, RECORD THE FOLLOWING MEASUREMENTS:

| | CIRCUIT 1 | CIRCUIT 2 | CIRCUIT 3 | CIRCUIT 4 |
|---|---|---|---|---|
| SUCTION PRESSURE | | | | |
| SATURATED SUCTION TEMP | | | | |
| SUCTION LINE TEMP | | | | |
| SUPERHEAT DEGREES | | | | |
| DISCHARGE PRESSURE | | | | |
| SATURATED CONDENSING | | | | |
| LIQUID LINE TEMP | | | | |
| SUBCOOLING DEGREES | | | | |
| LIQUID SIGHT GLASS (CLEAR/BUBBLES) | | | | |
| ENTERING CONDENSER-WATER TEMP | | | | |
| LEAVING CONDENSER-WATER TEMP | | | | |
| EVAP ENTERING-AIR DB (dry bulb) TEMP | | | | |
| EVAP ENTERING-AIR WB (wet bulb) TEMP | | | | |
| EVAP LEAVING-AIR DB TEMP | | | | |
| EVAP LEAVING-AIR WB TEMP | | | | |

COMPRESSOR AMPS:

| | | | | |
|---|---|---|---|---|
| L1 | | | | |
| L2 | | | | |
| L3 | | | | |

SUPPLY FAN AMPS:

| | | |
|---|---|---|
| L1 | | |
| L2 | | |
| L3 | | |

NOTES: ____________________________________________

____________________________________________

____________________________________________

____________________________________________

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE